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CHEMICAL REFLECTIONS

RELATING TO THE

NATURE, CAUSES, PREVENTION AND,

CURE OF SOME DISEASES;

IN PARTICULAR

THE SEA SCURVY, THE STONE AND GRAVEL,

THE GOUT, THE RHEUMATISM, FEVERS, &C.

CONTAINING

OBSERVATIONS UPON AIR; UPON CONSTITUENT PRINCIPLES; AND THE DECOMPOSITION OF ANIMAL AND VEGETABLE SUBSTANCES:

With a Variety of Occaſional Remarks,

PHILOSOPHICAL AND MEDICAL.

To which is added,

THE METHOD OF MAKING WINE FROM THE JUICE OF THE SUGAR CANE.

By JAMES RYMER, SURGEON, at RYEGATE.

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TO THE RIGHT HONOURABLE

THE EARL

BATHURST,

THIS TREATISE

IS HUMBLY INSCRIBED,

BY HIS LORDSHIP'S

MOST OBLIGED,

AND

MOST HUMBLE SERVANT,

Ryegate, Dec. 1,
1783.

THE AUTHOR.

CHEMICAL

REFLECTIONS, &c.

DR. LIND thinks, with many other learned and ingenious men, that the marine or true Scurvy " ſeems to be induced by the agency of certain external cauſes." In this light the Scurvy was viewed as an epidemical diſeaſe.

it in general, certainly cannot produce ſcurvy. Sea water, taken occaſionally as a purge, will not produce ſcurvy. We have an inſtance of ſea ſalt being a powerful antiſeptic, inaſmuch as it preſerves animal ſubſtances from putrefaction; witneſs ſalt beef, ſalt pork, ſalt fiſh, &c.

It is recorded that the ſcurvy broke out on board Lord Anſon's ſquadron, when there was plenty of freſh meat on board. We very well know that freſh meat, inſtead of producing ſcurvy, will have a ſhare in the cure of it; wherefore in the above caſe, there muſt have been a powerful cauſe of ſcurvy prevailing, which freſh meat could not counteract. What that cauſe was we ſhall conſider and endeavour to prove, very clearly, by and by.

The ſaline effluvia from the ſea, Dr. Lind thinks, have no ſhare in producing ſcurvy. He quotes, in ſupport of this, the good health enjoyed by the men who work in the ſalt pits in Poland, who muſt be expoſed to the vapour of the marine acid; few workmen are ſaid to be more healthy.

The ſaline effluvia, or the vapour of the marine acid at ſea, as it has a great affinity with phlogiſton, I think, cannot produce ſcurvy. The vapour of the marine acid is a powerful antiſeptic.

Dr. Lind thinks, and brings plauſible arguments to ſupport it, that abſtinence from vegetables and fruit can be but the *occaſional* cauſe of ſcurvy; ſuch as tedious blockades by the ancients, till they forced a ſurrender by famine; yet the antients have given us no account of the ſcurvy in conſequence of it. The Doctor ſays, " it would be tedious to give many inſtances, they being well known of ſhips crews continuing ſeveral months at ſea upon their ordinary diet, without any approach of the ſcurvy. I have been three months on a cruiſe, during which time none of the ſeamen taſted vegetables or greens of any ſort; and although, for a great part of that time from want of freſh water, their beef and pork were boiled in the ſea water, yet we returned into port without one ſcorbutic complaint."

Abſtinence from vegetables and fruit will not produce ſcurvy, if ſeamen and others, in ſuch a caſe, be ſupplied with ſuch things as yield the ſame principles, viz. vegetable fixed air and vegetable phlogiſton, or phlogiſton modified by vegetation. The ancients, in their tedious blockades, if deprived of vegetables and fruit, muſt have had ſomething to eat or to drink which abounded with, and eaſily yielded in the ſtomach, vegetable fixed air, otherwiſe we ſhould have heard of their having ſuffered by ſcurvy. If ſeamen have continued free from ſcurvy ſeveral months, as I have known it to be the caſe, at ſea, upon ordinary diet, it may be depended upon they were furniſhed with ſomething which anſwered the end of vegetables and fruit.

In ſubſequent cruiſes, Dr. Lind had experience of the ſcurvy raging in his Majeſty's ſhip Saliſbury, in leſs than ſix weeks after having left Plymouth, where plenty of all ſorts of greens was to be had; "by which (the Doctor ſays) as one would have thought, the ſailors had ſufficiently prepared their bodies againſt the attack of this malady." In this channel ſquadron, out of 4000 men, 400 were violently afflicted with the ſcurvy. The Doctor adds, "and what puts it beyond all doubt that the diſeaſe was not occaſioned ſolely by the want of vegetables for ſo ſhort a time, is, that the ſame ſhip's company of the Saliſbury, in much longer cruiſes, kept quite free from the diſtemper, where their circumſtances, as to the want of freſh vegetables, were ſimilar."

The human body can never, by the uſe of vegetables and fruit, be ſufficiently prepared on ſhore to reſiſt all attacks of ſcurvy at ſea, if then cut off from every ſupply of vegetable principles: under ſuch circumſtances, every ſeaman will be moſt liable to ſcurvy. Farmers, countrymen, landſmen, at ſea, ſuffer ſooneſt, and more than ſeamen, when ſuddenly deprived of diet and drink, which yield the conſtituent principles of vegetables.

If ſeamen labour under the cauſe of ſcurvy in certain ſtates of the atmoſphere and degrees of heat they have not been accuſtomed to, the diſeaſe will be more or leſs malignant. This is a fact with reſpect to every diſeaſe.

Above one half of the people on board Lord Anſon's ſquadron died of ſcurvy when they had been but little more than three months at ſea, while whole countries are obſerved to live on the ſame, nay even a leſs wholeſome diet; and many people for years abſtain from vegetables, without almoſt any inconvenience. Thence Dr. Lind concludes "there are unqueſtionably to be found at ſea other ſtrong ſources of ſcurvy," which he terms *pre-diſpoſing* cauſes.

Becauſe above one half of Lord Anſon's people died of ſcurvy, when they had been but little more than three months at ſea; becauſe whole countries may have been obſerved to live upon the ſame, or even a leſs wholeſome kind of diet; and becauſe many people abſtain from vegetables for years without almoſt any inconvenience,

convenience, we are not thence to conclude that there are ſtrong ſources of ſcurvy at ſea, or peculiar to the ſea life. So far as I can judge it is really not ſo. Thouſands and thouſands have lived on ſhipboard forty, fifty years, and upwards, without ever having had the ſcurvy; but then, depend upon it, they were not deprived of freſh ſupplies of vegetable principles; without which, human life, on board, or on ſhore, cannot long ſubſiſt.

The confined and polluted air in a ſhip, and the ſtagnation of the *bilge-water* in the hold, do not render the perſons moſt expoſed to them more liable to ſcurvy than others on board. Dr. Lind believes this from his own experience, and from the accounts of others.

If the common air reſt upon a ſurface of putrid water, it is always diminiſhed, and rendered noxious to reſpiration and flame. This effect will happen ſooner if ſuch water, viz. water highly charged with a combination of phlogiſton and alkaline air, be agitated. Bilge-water, which ſmells very offenſively, is for the moſt part agitated in ſhips at ſea; and frequently the air in a ſhip's well has inſtantly killed men who breathed it. Confined and polluted air in a ſhip, or air ſuper-phlogiſticated, and rendered otherwiſe noxious by animal ſteams, although it be in the higheſt degree deleterious, yet it will not produce ſcurvy. The ſcurvy ariſes from a very different cauſe.

Filth, or want of cleanlineſs, in a cloſe place, and where the perſpiration of a multitude of people is pent up and confined, Dr. Lind thinks, rather produces that evil diſpoſition of air from which ariſes the contagious fever called the *jail diſtemper*. This is rational and probable.

Dr. Lind ſays, the ſcurvy by itſelf is often experienced to make great ravage where the air has been properly renewed and ventilated, and the whole ſhip kept clean and ſweet; "and what is farther pretty remarkable, we know (ſays he) that the ſcurvy may be perfectly cured in the impure air of a ſhip."

In a voyage to North America, on board his Majeſty's ſhip America, during the fineſt weather, and in the cleaneſt and ſweeteſt of ſhips, the ſcurvy made great havock. Samuel Thompſon, Eſq. the commander, whoſe attention to cleanlineſs, and humanity to the ſick, could only be exceeded by his ſkill as a ſeaman, and his bravery as an officer, ſpared no pains nor expence to prevent and remove the melancholy evil; but as the cauſe of the diſeaſe was the want of vegetable principles, whatever was done at ſea did not avail. If ſeamen, breathing the pureſt common air, be deprived of the conſtituent principles of vegetables for a certain time, the ſcurvy will aſſuredly ſhew itſelf amongſt them: if, on the contrary, ſeamen, having the ſcurvy, and breathing the common air rendered noxious in ſome degree in a ſhip, be properly ſupplied with whatever yields the vegetable principles,

ciples, the ſcurvy will certainly be removed.

Dr. Lind ſays, " It muſt be allowed, that the air, which is a compound of almoſt all the different bodies we know, has many latent properties by which animals are variouſly affected; and theſe we neither can at preſent, nor perhaps ever ſhall, be able to inveſtigate. We do not (ſays he) even know certainly what this *pabulum vitæ* is, in that fluid, which preſerves and ſupports human life."

The great Dr. Prieſtley has analyſed the common air in a very plauſible, and, I think, probable manner. Whichever way I conſider Dr. Prieſtley's account of the conſtituent parts or principles of common air, it ſeems to be chemically and philoſophically conſiſtent, and agreeable to the laws of material combination. If I underſtand the Doctor, he looks upon common air to be a neutral fluid; compoſed of an acid air and modified phlogiſton. The acid air may be either fixed air, nitrous air, marine acid air; or, it may be an acid air, conſiſting of a combination of fixed air, nitrous air, and marine acid air. An acid air (if ſo, or otherwiſe compounded) is rationally ſuppoſed to have an affinity with phlogiſton, under a certain modification; ſo that phlogiſton thus modified, may be conſidered, in this combination, as an alkaline air. Common air, thus formed, is a *menſtruum* or ſolvent, and vehicle and receptacle for exhalations; ſome of which, with common air, would ſeem to form a mixture and not a ſolution. Smoke, in general, riſes in air, rendering it cloudy, till it be condenſed, when it falls in various ways upon the earth. Watery vapour ſometimes only mixes in the air, and at other times is perfectly diſſolved in it; but, in the cleareſt, and moſt apparently dry, ſtate of the air, any dry fixed alkaline ſalt expoſed to it will attract the watery vapour, and become wet. When the atmoſphere, from a very clear ſtate, becomes ſuddenly cloudy, and lets fall its watery contents in rain, we may ſuppoſe ſome decompoſition to have taken place; the watery vapour either having loſt ſomething, or acquiring ſome new principle, the attraction of coheſion takes place among the particles, which increaſing in weight, more matter in leſs ſpace, gravitation is the reſult: or, the common air ſupporting the watery vapour, robs it of its phlogiſton, and cauſes the precipitation. Lime-water, perfectly clear and tranſparent as diſtilled water, is no ſooner expoſed to fixed air, than it becomes turbid, owing to the particles of lime in the water acquiring the calcareous ſtate from their union with fixed air, which is one of the eſſential conſtituent principles of calcareous matter. Changes, from analogous cauſes, may, and there is no doubt but it is ſo, happen in the atmoſphere. Perhaps watery exhalations carry up ſome principle which the atmoſphere requires, and bring down ſomething, not only for its own purity as water, but for the nouriſhment of vegetables and animals. What water ſeems purer, clearer, more tranſparent than ſome pump-water, well-water, or hard water? The moment you drop into it a few drops of a ſolution of any fixed alkaline ſalt, as oil of tartar, it becomes turbid and milky. Hard water contains in ſolution what the chymiſts term a *ſelenetic ſalt*: a ſelenetic ſalt is the vitriolic acid and calcareous earth combined; when oil of tartar is dropped into it the ſelenetic ſalt is decompoſed; the vitriolic acid having a greater affinity with fixed alkaline ſalt than it has with calcareous earth, quits the latter and unites with the former. The calcareous earth now ſubſides in the form of a white matter.

When we ſay, *impure* air, we mean that the common air is charged with matter foreign to it; various vapours and exhalations which the atmoſphere in certain ſtates is capable to ſuſpend and keep diffuſed for a time. Thus we ſay *impure* water, whenever its colour and taſte are changed from their natural or common ſtate. Impure water is purified by diſtillation, and impure air is rendered pure by ſome natural proceſs in the courſe of God's providence. Water exhales with phlogiſton from its impurities, and is received by the atmoſphere, which ſuſpends it till it muſt fall in dew, rain, ſnow, or hail.

The common air, with reſpect to the reſpiration of animals, contains no *pabulum vitæ*: common air, in this view, is merely a vehicle for ſuperabundant phlogiſton, putrid effluvia, and watery vapour from the lungs of the animal. As in every animal there is a conſtant change going on, a continual ſucceſſion of matter; matter thrown out as effete and an acceſſion of new matter, the lungs may be viewed in one light as a grand pneumatic engine for throwing out of the ſyſtem a quantity of excrementitious matter in the form of vapour, which the common air receives, and diſpoſes of agreeably to the laws of nature or God's providence. Air may be either noxious to animal reſpiration, on account of the quality of what is mixed with it, or becauſe what is mixed and diſſolved in it renders the air incapable to receive that matter which the lungs naturally throw out of the ſyſtem in the form of vapour.

The common air, conſidered as a neutral fluid, may be decompoſed by whatever have a greater affinity with one of its conſtituent principles than that have with the others. I have no doubt but this happens frequently, when the air newly compounded, may have qualities which render it unfit for reſpiration. Phlogiſton would appear to be the univerſally active principle throughout all nature: guided by the will of the Majeſty of the Univerſe, phlogiſton ſeems to be the cauſe of animal life, of vegetation, of the various attractions, and of all the phenomena and operations of Providence, which we do not as yet comprehend; with an aërial baſe it forms air, with a vegetable baſe it forms whatever appertains to the vegetable kingdom, with a mineral baſe it forms all minerals and foſſils, and, with an animal baſe, it conſtitutes all living creatures and continues them in being ſo long as God's providence thinks fit; when, ſome natural cauſe, ſome mechanical action, renders the human body no longer a proper manſion for the immortal ſoul.

Animal oils and fat, we all know, are highly inflammable. It would appear, while animal oils and fat are in the ſtate of decompoſition, by ignition, or burning, that they conſiſt chiefly, of phlogiſton. Animals cannot exiſt without phlogiſton; nature ſeems to have laid up a ſtore of it in the adipoſe membrane to be taken into the circulation, in caſes of inanition and diſeaſe.

All vegetable ſubſtances abound with phlogiſton. Phlogiſton, fixed air, and a portion of earth ſeem in general, the watery part having been evaporated, to be the eſſential conſtituent principles of vegetable matter. The earthy part of moſt vegetables ſeems to be changed by fire into a fixed alkaline ſalt.

In autumn it would appear, that moſt trees and plants, eſpecially in northern climates, are fully ſaturated with phlogiſton, and can receive no more for that year. How highly inflammable are all the leaves which fall in autumn from the trees! and theſe leaves were all formed in the courſe of only a few months. What a prodigious quantity of phlogiſton muſt the vegetable kingdom imbibe, during the courſe of one year only! It is wonderful, when we conſider under what a variety of forms and modes phlogiſton exiſts. Rectified ſpirit, alcohol, appears to conſiſt of phlogiſton only. We are certain that this ſpirit is of vegetable origin; the vinous fermentation could not create it: it exiſted, though in another form or mode, in the juice of the grape, in ſugar, malt, &c. previous to theſe matters having undergone the ſpirituous fermentation.

Many minerals conſiſt of nothing beſides phlogiſton and earth. Some foſſils are, in the higheſt degree, inflammable. Inflammable ſubſtances, in general, will not burn unleſs they be acted upon by ſome agent. Fire, ignition, exiſts when any inflammable matter is in the ſtate of actual fiery decompoſition: to produce this effect an actual fiery yeaſt, or ferment, is neceſſary; and this fiery yeaſt, or ferment, appears to me to be nothing more than phlogiſton in its actual fiery ſtate, iſſuing from one inflammable ſubſtance, in the act of burning decompoſition into any other inflammable matter, whoſe latent or fixed phlogiſton becomes thereby active, quitting its earthy baſe, and is now greedily received by the common air. The common air is never fully and univerſally ſaturated with phlogiſton; if it were, nothing would burn in it, no animal could breathe it. The atmoſphere is continually loſing and receiving phlogiſton. There is an univerſal circulation of phlogiſton throughout all nature. While a lamp, a tallow candle, or a wax candle, is burning, we may obſerve the diſſipation of oil,

oil or ſpirit, of tallow, of wax; neither of which, if pure, leaves any conſiderable reſiduum; conſiſting chiefly of phlogiſton and vapour, which the common air receives.

A given quantity of common air will receive but a certain quantity of phlogiſton. A candle will burn but one minute in one gallon of common air, which then will be fully ſaturated with phlogiſton. An animal cannot breathe this air, becauſe ſuch air is unfit to receive what the animal diſcharges from its lungs in expiration.

When the lungs of a living creature are fully inflated by an inſpiration of common air, they may be ſaid to be inflated with phlogiſtic and putrid air, which we very well know to be the quality of expired air. Perhaps an animal dies the inſtant its lungs are overcharged with ſuch vapour, when it can have no timely vent.

The common air ſeems to ſuffer decompoſition by animal reſpiration: it would appear to quit ſome one of its conſtituent principles, forming an union with ſomething from the lungs. Fixed air is precipitated in expiration; for, breathing upon lime-water renders it turbid.

bid. Perhaps the fixed air comes from the animal's lungs: air has been collected from large ſcorbutic ulcers, which has had the ſame effect upon lime-water.

Putrid effluvia, I am inclined to think, conſiſt of phlogiſton combined with an alkaline air, both of the animal and vegetable kind, i. e. whether it ariſe from vegetable or animal decompoſition. Both kinds are intolerably offenſive, although the ſenſe of ſmelling diſcover a difference. Such air, together with fixed air, is plentifully diſcharged from carious bones, and putrid ſores of all kinds. The parts ſo affected may be ſaid to be in a ſtate of diſſolution. In putrid fevers ſuch air is diſcharged copiouſly, not only from the lungs, but from the ſurface of the body; and alſo by urine and ſtool. Such air, received into the ſyſtem of a healthy perſon, is capable to produce the ſame phenomena; it being a ferment.

In the advanced ſtate of the ſea ſcurvy there is not only a ſeparation of phlogiſton and alkaline air from the ſolids, but alſo a very great quantity of fixed air. A perſon ſo affected is really in a ſtate of actual diſſolution and decompoſition; the attraction of coheſion is deſtroyed, or ceaſes to act; and the conſtituent parts of the animal fibre repel each other and eſcape.

Fixed air enters in great abundance into the animal ſyſtem: it is certainly one eſſential component principle of the animal conſtitution. Fixed air eſcapes very copiouſly in the ſcurvy.

An animal body is made up of fibres or threads; and every fibre or thread is compoſed of leſs fibres *ad infinitum*. No perſon has ever diſcovered the original fibre; and it is probable no one may ever diſcover and comprehend its nature. Although we be very ignorant of the conſtitution of elements, yet we are very certain that fibres, or fleſhy threads, conſtitute the various animal organs. When the principle of coheſion ceaſes to act in an animal fibre, its conſtituent parts, as I obſerved before, repel each other. Now, though we know not the nature of theſe conſtituent parts, when in a ſtate of union, we are very certain that phlogiſton, alkaline air, and fixed air, in abundance, ariſe from every part of an animal in a ſtate of actual decompoſition. Muſcle, or red fleſh, is made up of tubes or veſſels, and theſe tubes, or veſſels, are compoſed of fibres; when theſe fibres decompoſe, the veſſels of courſe cannot hold their contents, extravaſation takes place, and, as in the ſcurvy, are diffuſed and accumulated in and about the affected parts, forming and cauſing in the ſcurvy the various ſwellings, diſcolourations, bumps, ſtiffneſſes, rotten gums, and the whole phenomena of the diſeaſe. The heart, and all the large veſſels about it, loſing their tone and elaſticity, the cavities become wide and enlarged in diameter; and when the body, in the advanced ſtate of the diſeaſe, is placed in the erect poſture eſpecially, the blood ſuddenly gravitates from the brain. Hence one principal cauſe of fainting and ſudden death, when ſcorbutic patients are taken out of bed to be ſent to hoſpitals from ſhips, or are ſo diſturbed for any caſual reaſon.

Some diſeaſes appear to me to be nothing more nor leſs than a tendency to animal decompoſition. This tendency to animal decompoſition in a living creature is ſometimes local, and at other times it is univerſal throughout the fleſhy and fluid parts, as in fever.

Decompoſition may take place in a gland, in part of a bone, of a muſcle, of adipoſe membrane. Part of the liver, the lungs, the brain, or of any organ, may be in a ſtate of decompoſition. The injury done to health by ſuch local decompoſition will depend upon the office of the organ ſo affected.

In a tendency to univerſal decompoſition, in a living man; the conſtituent animal principle which is diſpoſed to ſeparate from the reſt and eſcape, may be either phlogiſton, fixed air, or alkaline air, or a peculiar acid air. In the ſcurvy it would appear to be chiefly fixed air which is diſpoſed, in a high degree, to quit the ſyſtem. But, whatever cauſe diſpoſe one conſtituent principle to quit its animal nature, the others would appear in a greater or leſs degree, to be diſpoſed to ſeparate alſo.

It would appear, there can be no vapour, no exhalation from animal bodies, without phlogiſton. It would alſo appear that a certain quantity of modified phlogiſton gives natural colour to the blood, and keeps it in a due conſiſtence; any increaſe or diminution of which will be attended by morbid ſymptoms.

In an animal body there be a phlogiſton peculiar to the brain and nerves, independent of that phlogiſton which enter into the conſtitution of brain and nerve. The ſpinal marrow and the nerves appear to me to be the excretory ſyſtem of the brain and cerebellum. The great quantity of blood ſent to the brain and cerebellum, I think, furniſhes that ethereal phlogiſton, which, directed and guided by the immortal ſoul, is the cauſe of all animal and vital phenomena.

There be a phlogiſton peculiar to the groſs circulating fluids and animal ſolids, modified according to the nature of the matter: boney matter, fleſhy matter, fatty matter, containing the ſame principle, under different modes of combination.

In *inflammatory* diſeaſes there would ſeem to be a ſuperabundance of a kind of active phlogiſton in the ſyſtem. Nature appears to labour till the quantity be diminiſhed by reſpiration and the watery evacuations; watery fluids imbibing phlogiſton very powerfully.

In *putrid* diſeaſes, again, there would appear to be a deficiency of active or vital phlogiſton, and a waſte of fixed or material phlogiſton. In *putrid* diſeaſes this conſtituent phlogiſton, become now excrementitious, eſcapes abundantly from the lungs. In *putrid* diſeaſes phlogiſton

giſton and alkaline air ſeem to be ſet looſe throughout the ſyſtem, and, combining, are thrown out of the body in the mode of putrid effluvium; in which ſtate, as from the plague or gaol diſtemper, I look upon it to be a fatal ferment if received into a healthy conſtitution in ſufficient quantity: common air impregnated by ſuch vapour, is, in the higheſt degree, dangerous to mankind.

Beſides the phlogiſton which enters into the compoſition of animal matter, as I have already obſerved, and wiſh to repeat, a living creature would appear to require a certain quantity of it under a peculiar modification, and nice equilibrio, for carrying on the vital and active offices. The former I would be inclined to call fixed phlogiſton; and the latter, volatile, vital, ethereal, phlogiſton; confined to the brain and nervous ſyſtem.

To preſerve and continue health, an animal body muſt be ſupplied with aliments which contain all the conſtituent principles of animal and vital matter; of which principles, any one being wanting, either on account of its not exiſting in particular aliment, or becauſe ſome aliment, containing it, does not yield it in the courſe of digeſtion, diſeaſe will be the reſult. On ſhore, or at ſea, if vegetable fixed air be not taken in with the aliment, and detached in the ſtomach and inteſtinal canal, the true ſcurvy will ſoon ſhew itſelf.

When *diſeaſe* terminates fatally, notwithſtanding the morbid ſtate of organs, the brain excepted, death may be the conſequence of the blood containing no materials, or *pabulum*, for the preparation of vital phlogiſton in the brain and cerebellum.

An animal body is conſtantly in a ſtate of change. There is a demand for freſh materials, for freſh matter; capable to furniſh the principles of the animal conſtitution, which are continually in a ſtate of, now, attraction; and, now, of repulſion.

In diſeaſes in which the bark is uſed with ſucceſs, I conceive the bark to be efficacious by ſome way or another increaſing the power of attraction of coheſion, thereby enabling the animal fibre to retain its conſtituent principles a due time.

The bark will not be efficacious in the ſcurvy, if there be a want of that aliment which is capable to furniſh one or other of the conſtituent princiciples of the body; and which, in this diſeaſe, would appear to be, certainly, vegetable fixed air.

One reaſon, perhaps, why an animal body requires a conſtant ſupply of freſh principles, is, that it may be able to counteract the preſſure of the atmoſphere, in a degree conſiſtent with the well-being of the creature. Air, which forms a great part of the animal body, if it be retained longer than it ought to be, that is, if it have not been renewed; the old air thrown out of the ſyſtem, and new air received in lieu, ſuch old air would appear to become rarefied and expanded, burſting its boundaries, and, retained by membraneous parts, cauſing ſwelling and tumour. We ſee dead bodies in the open air ſwell prodigiouſly, notwithſtanding the preſſure of the atmoſphere. The fixed air, taken up in a condenſed ſtate, ſeems to be now liberating itſelf, acquiring elaſticity and expanſion: or, the conſtituent parts of ſuch air may be now in a ſtate of repulſion, which may go on till the particles ſhall be juſt within the ſphere of each other's attraction, like cluſters of air bubbles. What a diſtreſſing caſe would it not be if our conſtituent air were to expand thus while in life! Indeed, when the mercury falls in the tube of the barometer, towards 28 inches, many people feel as if ſomething of that kind were about to happen: there is no doubt but it would in an exhauſted rever.

hat our fixed air, in the ry, becomes, in ſome degree, ic and expanſive, dilating and detaching itſelf in the univerſal tendency to decompoſition, I think is probable, in whichever way I conſider the ſubject.

That phlogiſton exiſts in a detached ſtate in the inteſtinal canal, upon peculiar occaſions, is certain. Inflammable air is frequently diſcharged from the anus. The flame of a candle, held at a proper diſtance, will cauſe an inflammable *flatus* to explode. This particular kind of *crepitus ventris* has an intolerable and peculiarly offenſive odour. It would appear to conſiſt of phlogiſton and alkaline, or putrid air.

The human fœces are ſtrongly impregnated with the phlogiſtic principle. Air that has reſted a ſufficient time upon human fœces in the funnel of an old privy, is frequently highly inflammable. Indeed ſuch air may have ariſen wholly from the fœces. Much phlogiſton is diſcharged from the ſyſtem, with the excrement, by ſtool. Fluid matter imbibes phlogiſton; whence the great thirſt attending

ing inflammatory diſeaſes. Nature adopts this method to get rid of ſuperabundant detached phlogiſton. The drink taken into the ſtomach imbibes the phlogiſton, and by the natural outlets it paſſes off; whence, alſo, the increaſed action of the heart and arteries, the rapid circulation of the blood, and the conſequent phenomena of inflammatory fevers.

In caſes of indigeſtion, when the ſtomach has been overcharged with flatulent and indigeſtible aliment, thirſt may ariſe from another cauſe, or, rather, for a ſimilar reaſon, viz. to abſorb, or imbibe fixed and other air, in the ſtomach and inteſtines. Cold *boiled* water is beſt in ſuch caſes, it being previouſly deprived of great part of its own air, is diſpoſed to imbibe a greater quantity of other air.

Dr. Prieſtley thinks that the inſtantaneous death of animals put into vitiated air is owing to ſome *ſtimulus*, which, cauſing univerſal and violent convulſions, exhauſts the whole of the *vis vitæ* at once. His reaſon for thinking ſo is, becauſe the manner of their death is the very ſame in all the different kinds of noxious air. But, humbly begging leave to differ a little in opinion from an author ſo great and juſtly celebrated, I think the phenomena of the epilepſy would ſeem to contradict the whole of the *vis vitæ* being exhauſted at once by univerſal and violent convulſions. The ſtimulus, in the former caſe, would rather appear to me to ariſe from that nice equilibrium of vital phlogiſton being inſtantaneouſly deſtroyed in the ſyſtem. There would ſeem to be an immediate retrogradation, regreſſion and accumulation of the vital phlogiſton in the brain and nerves, in conſequence of the quantity of phlogiſton uſually thrown out of the lungs being ſuddenly detained in them; nature ſtruggling to diſpoſe of it, it to free herſelf from actual ſuper-phlogiſtication, throws the whole muſcular ſyſtem into action.

As it happens to a jar overcharged with the electric matter or principle (which, by the bye, would appear to be phlogiſton under a peculiar modification) ſo the vital phlogiſton in the brain, cerebellum, and medulla ſpinalis, diſcharging and exploding, may cauſe ſome derangement in the texture and ſubſtance of theſe organs; whence, death.

With reſpect to the matter diſcharged from the lungs of animals in expiration, I look upon it to be an excrementitious phlogiſton combined with alkaline and fixed air. I remember, being on board one of his Majeſty's ſhip's, in the Mediterranean ſea, nearly half way between Carthagena and the coaſt of Barbary, a whale emerged cloſe along ſide of the ſhip, to windward, to diſcharge its air, and take in a freſh ſupply. The ſmell of the air which it diſcharged, was more offenſive and inſufferable, than any kind of putrid effluvia I ever met with. Several perſons on board, as well as myſelf, were affected with momentary ſuffocation; and we became ſick at the ſtomach, with an inclination to reach. A kind of faintneſs and languor remained with us ſome time.

That certain air or vapour, ariſing from vegetable and animal matter, in *certain* ſtates of decompoſition, is capable of acting as a ferment, if received completely and in ſufficient quantity, into the human ſyſtem, I firmly believe.

It appears rational to me, whenever any ſuch vapour, ferment, or miaſma, have been received into the animal body, producing therein a tendency to fermentative decompoſition, that whatever completely check ſuch tendency to fermentation and decompoſition, is, of courſe, the ſubſtance which will cure the diſeaſe.

In intermittent fever, whatever be the cauſe of this diſeaſe, whether marſh-effluvia, or not, there appears to me to be an alternate ebbing and flowing, a ſucceſſive diminution and increaſe of vital and fixed phlogiſton. The phenomena of the cold fit exhibit evident ſigns of univerſal debility and diminiſhed energy of the vital and moving powers. The phenomena of the hot fit as evidently ſhew a general increaſe of vital power, and accumulation of phlogiſton. The ſweating ſtate exhibits the method nature adopts to bring about an equilibrium.

Whether, in certain ſtates of the body, there be any affinity or attraction between the vital and fixed phlogiſton of animals, and whether the former be ever converted into the latter, and *vice verſa*, is beyond my comprehenſion to decide. But, in the progreſs of intermittent fever, as the animal matter is univerſally diminiſhed, the whole body emaciated, it is evident decompoſition muſt have been going on from the firſt attack. Perhaps, in this diſeaſe, phlogiſton is the conſtituent principle moſt diſpoſed to become volatile, and to quit the body. However it be, no ſubſtance has been hitherto found ſo capable to check this diſpoſition, as the Jeſuit's bark.

In *lues venerea* there is decompoſition wherever that peculiar ferment which occaſions the diſeaſe is retained; as in gland, bone, and parts in contact with the venereal ulcer, or caries. Whichever way mercury act, whether chemically with the virus, or mechanically upon animal fibre, it is certain, that when the affected parts diſcharge matter ſimilar in quality to the original ferment, mercury will check and remove the proceſs.

In the ſmall-pox, perhaps, ſome ſubſtance ſhall be found capable to check that proceſs in the human body which the variolous matter produces.

It ſeems probable to me, that in the Stone and in the Gout, the ſtony bodies in the former, and the chalky matter in the latter, are the conſequences of the union of a peculiar acid with ſome earth.

It is ſuppoſed, that fixed air is of the nature of an acid. Fixed air expoſed to lime-water cauſes precipitation, by reaſon of the particles of lime attracting fixed air, by which it acquires its original ſtate previous to calcination, whereby it was deprived of its fixed air.

It has been obſerved above, that *hard* water contains in ſolution a ſelenetic ſalt, viz. a neutral ſalt, compoſed of vitriolic acid in union with an earth. It has alſo been obſerved above, that oil of tartar, *per deliquium*, or other fixed alkali, dropped into *hard* water, cauſes precipitation of the ſelenetic earth, by reaſon of the vitriolic acid quitting that earth and uniting with the fixed alkali, with which it hath a ſtronger affinity.

Notwithſtanding ſome perſons ſeem more diſpoſed than others to the ſtone and to the gout, I am of opinion that every perſon may be liable to both diſeaſes, in conſequence of ſuch aliment and drink as leave in the human body that kind of earth, and that kind of acid, which, in union, form the ſtone in the urinary bladder, and the chalky matter about the joints, of the extremities, eſpecially.

I ſhall not, in this place, enter into any ſpeculation about the effects of cyder, certain wines and fermented liquors, containing earth, acid, fixed air, &c. relative to the ſtone and to the gout; but I ſhall moſt heartily recommend to every perſon having reaſon to be apprehenſive of the ſtone or gout, and, in an eſpecial manner, to perſons labouring under one or other or both diſeaſes, a preventative and method of cure.

Perſons having reaſon to be uneaſy about the ſtone and the gout, and perſons really afflicted with thoſe diſeaſes, are requeſted to make uſe of an alkaleſcent diet and drink. That I may not, however, be eſteemed a rigid counſellor, I will allow every gravelly and gouty perſon to eat whatever beſt pleaſe the palate and agree with the ſtomach, provided the following drink be always uſed, viz. ardent ſpirit mixed with water. To every pint of rum and water, brandy and water, Holland's and water, I would deſire that from ten to thirty drops of the *oil of tartar per deliquium*, be added. A ſolution of any fixed alkaline ſalt in water, will anſwer, provided it be equally ſtrong.

The volatile ſalts in ſolution, as ſpirit of hartſhorn, ſal volatile, &c. might be uſed with advantage in the proportion of one or two ſpoonfuls to a pint of the above common drink; but that they are apt to increaſe the pulſe, producing feveriſh ſymptoms.

If the above diſeaſes be complicated with rheumatiſm, the volatiles may be ſubſtituted, or occaſionally uſed, with great ſucceſs; and, in this caſe, ſuch drink is more adviſeable towards bed-time.

If any lady or gentleman, ſo afflicted, uſe wine, it ought to be old, and of the richer kind; to each glaſs of which from two to ſix drops of the oil of tartar ſhould be added; more or leſs, as it agree.

In the ſtone and the gout, the reaſon why I recommend an alkaleſcent regimen, will be evident to perſons ſkilled in chemiſtry; but, for the information of others, I ſhall juſt mention that an alkaline ſalt, thus gradually introduced into the ſyſtem, will not only very certainly tend to prevent the further formation of calculus and chalky matter, but likewiſe powerfully tend to decompoſe ſtony bodies in the kidnies and urinary bladder, and chalky matter about the joints, in conſequence of the fixed alkaline ſalt uniting with that acid, which, with earthy matter, forms the ſtony concretions: for, the earthy matter, meeting now with no acid to combine itſelf with, paſſes off by urine, &c. The neutral formed by the alkaline ſalt with the acid, can aſſume no concrete mode; it remains in ſolution, and paſſes off in a fluid ſtate by the natural outlets. There is another benefit attending a neutral ſalt thus formed within the body; it will promote the excretions, and attenuate viſcid phlegm.

Having ſtrayed very ſtrangely and widely from my text, I humbly aſk pardon of the reader for this and every other offence againſt *method.*

Upon the whole, then, in reſpect to common air having many latent properties by which animals are variouſly affected, according to the opinion of Dr. Lind, and other learned men, I would beg leave to obſerve, that the common air, like the common freſh water we uſe at our meals, is healthy or noxious according as the one or the other be charged with foreign matter. If the common air abound with any vapour, which we know to be in the higheſt degree noxious to animal reſpiration, whether it be effluvia from vegetable or animal matter undergoing putrefaction; or, the noxious vapour from animals' lungs, or inflammable air, fixed air, marine acid air, nitrous air, or other deleterious fumes; common air, ſo charged, will produce morbid effects, in a greater or leſs degree, according to circumſtances. It is here to be obſerved, however, that ſuch fumes and vapours are preſumed to become eſſential component principles of the common air. Were it not for the decompoſition of animal, vegetable, and mineral matter, it is to be feared the whole atmoſphere would not only ſoon be rendered unfit for animal reſpiration,

ration, &c. but become extinct. Fermentation, putrefaction, and combuſtion are vaſt ſources of common air.

The ſcurvy has been obſerved to prevail more upon certain coaſts, and in ſea-port towns, than upon the ocean; as upon the coaſts of the Baltic, the Engliſh channel, Norway, and Hudſon's Bay. I have again to obſerve, that in all theſe parts, ſeamen eſpecially, drink a great quantity of ardent ſpirit; which, unleſs ſome article of diet ſupply the body ſufficiently with vegetable fixed air, always diſpoſes to, and aggravates the ſcurvy. It is generally known, and it ought to be univerſally lamented, that a prodigious quantity of ardent ſpirit is drank in ſea-port towns. Nothing can be more deſtructive to mankind than an improper uſe of ardent ſpirit.

If ſhips and fleets be attacked with this diſeaſe, while in harbour, it is becauſe the people are not ſupplied with ſuch food or drink as yield vegetable fixed air.

I had the honour to ſerve his Majeſty, as ſurgeon to one of his Majeſty's line of battle ſhips in North America. The fleet, under the command of Admiral

A———, lay a conſiderable time in Gardiner's Bay; the ſcurvy and ſcorbutic flux prevailed on board every ſhip. Why? Becauſe the poor men were ſupplied with no food nor drink capable to furniſh what the human body ſo eſſentially required, vegetable fixed air. There was no ſcurvy among the officers; why? becauſe the officers drank wine, and nice briſk beer and porter, copiouſly abounding with fixed air. The officers, moreover had, at times, vegetables and freſh meat: of the latter, when it could be had at the Admiral's terms, as I was informed, the ſailors were now and then ſupplied. It was then a common report in the fleet, that the Admiral conceived, and ſaid, and affirmed, that ſalt beef would cure the ſcurvy. If the Admiral had read and underſtood the writings of Dr. Prieſtley, upon the various kinds of factitious air, it is clear, no one would have believed ſuch a conceit could poſſibly originate in his mind. And it is as certain, if Dr. Prieſtley had commanded that fleet, he would have ſaved the King's brave men at the King's expence. While good wines were at that time cheap in New York; while good beer, good porter, and good cyder, and freſh meat too, might have been purchaſed in abundance, a generous philoſopher would not have ſuffered gallant men to periſh for want of the vegetable principles ſo abſolutely eſſential to the preſervation and continuance of human health, though a *monarch* might challenge the bill. Œconomy, in ſuch a caſe, is truly being a penny wiſe and a pound fooliſh. But it is with nations and individuals in the *political*, as it is with animals and vegetables in the *natural* world; while ſome are decompoſing, others are *fattening* and compounding. Brave, generous hearts! whoſe miſery I beheld, whoſe drooping ſouls I could not comfort, alas ye are no more! Then what availeth it that I draw upon my poor head the ill-will of a pitiful, ſneaking few? It is, becauſe, *miſery*, I have *always* a kind tear at thy ſervice; and, *tyranny*, becauſe I would *puniſh* thee, whoſe proffered friendſhip, or ſwaggering menaces, I equally and heartily deſpiſe, wert thou ever ſo great, ever ſo rich, ever ſo emblazon'd, ever ſo eſcutcheoned.

My feelings were never more diſtreſſed at the ſufferings of humanity, than upon that ſervice. We loſt many men by the ſcurvy. With reſpect to medicines, I tried every one in my poſſeſſion that I thought might anſwer, without effect. I conſumed a great deal of Peruvian bark to no purpoſe; the elixir of vitriol was of no uſe; if it met with any alkaline matter in the ſtomach or bowels with which it effervеſced, the air ſeparated by that proceſs did not anſwer the end of vegetable fixed air. I reſolved to make an experiment at my own expence; I purchaſed ſome ſtrong beer in briſk fermentation; I gave of it to ſix men in an advanced ſtate of ſcurvy at the rate of one quart *per diem*; at the end of ten days they were wonderfully recovered. The Admiral, indeed, at one time, ordered a ſupply of lemons. The greater number of what fell to our ſhare I ſqueezed and preſerved the juice in bottles. The ſupply was not adequate to our neceſſities; but I took as much care of it as I poſſibly could, giving it only to ſad objects in the laſt ſtage of ſcurvy. The efficacy of the lemon juice was ſenſibly perceived. Here, by the bye, one cannot help taking notice of the different effects of mineral and vegetable acids: the elixir of vitriol did not anſwer, but lemon juice did. The air ſet looſe in the bowels by lemon juice, muſt have been of the nature of vegetable fixed air.

The eſſence of malt, as uſed in the navy, did not anſwer. This matter contained the vegetable principles which cure ſcurvy, in great abundance, but not having previouſly undergone fermentation, the eſſence of malt was of little or no ſervice in the cure of ſcurvy; but, when it had been fermented to ſuch a degree in water that the liquor contained much fixed air, it then effectually anſwered as well as any other liquor highly impregnated with vegetable fixed air, in conſequence of the vinous or ſpirituous fermentation, would have anſwered.

All vegetable matter, capable of going through the vinous fermentation, abounds with fixed air and phlogiſton. Sugar, in an eſpecial manner, abounds with fixed air and phlogiſton; but ſugar, in its characteriſtic ſtate, will not cure the ſcurvy. If ſugar be diſſolved in water, and ſome yeaſt be then added, the vinous or ſpirituous fermentation will immediately take place in the ſolution; that is, the ſugar then begins to decompoſe, and the water imbibes its eſſential component principles, viz. fixed air and phlogiſton: in this proceſs a vaſt quantity of fixed air eſcapes; but the liquor will not be ſo ſenſibly impregnated with phlogiſton or ardent ſpirit till the decompoſition of the ſugar be nearly effected. The ſtrength of this liquor, or the quantity of ardent ſpirit generated in it will be in proportion to the quantity of ſugar to a given quantity of water, and will depend much upon the manner by which the proceſs of fermentation was conducted. Every body, from the ſame materials, cannot make equally good malt liquor. There is a ſomething in the conduction of every operation which can only be acquired from experience reſulting from actual and habitual practice. Talents for accurate obſervation and diſtinction are peculiurly requiſite in ſuch caſes.

If the prediſpoſing cauſes to ſcurvy at ſea, be not conſtant but caſual, the ſame obſervation holds good relative to diſeaſes every where. The climate, the ſeaſon of the year, the ſtate of the atmoſphere, and many adventitious circumſtances, contribute to produce morbid effects. But, in fact, I know of no prediſpoſing cauſes to, nor other cauſes of ſcurvy, at ſea, but the want of that aliment which ſupplies the human body with conſtituent principles, the chief of which at ſea is vegetable fixed air. If any additional quantity of phlogiſton were required to prevent or cure the ſcurvy, then grog, or rum and water, or other ardent ſpirit mixed with water, would be efficacious. Grog, in general, when the ſhips beer is expended, is ſerved to the people, in lieu of beer or wine, in his Majeſty's navy. I have always found that the ſcurvy was more frequent and inveterate when the ſeamen were ſerved grog, if they had no article of diet which furniſhed the vegetable fixed air, as the alimentary vegetables and fruit.

In reſpect to the weather, it may, I think, be obſerved in general, that when the mercury falls below 29 inches, the atmoſphere has been diminiſhed by ſome cauſe or other. Perhaps it is then in a manner ſuperphlogiſticated. When the mercury in the tube of the barometer riſes above 29 inches and a half, the atmoſphere would appear to me, in general, to be more diſpoſed to receive the inflammable principle. In the former ſtate, the common air is not ſo fit for reſpiration, nor ſo favourable to the decompoſition of matter in the ſtate of combuſtion: in the latter ſtate, animals breathe freely and pleaſantly, and fires burn more vehemently and clearly. Scorbutic or other patients will ſeem worſe in the former ſtate of the air, and better in the latter.

In cloſe, foggy weather, the atmoſphere is aſſuredly diminiſhed; its weight, preſſure, elaſticity, being evidently leſſened, in conſequence, moſt probably of a ſuperabundance of phlogiſton; whence it muſt be leſs capable to receive any addition of the inflammable principle.

It has been ſaid above, that ſpirit, oil, wax, or tallow, would ſeem, in burning, to conſiſt chiefly of phlogiſton. If this were ſtrictly the caſe, the great waſte of inflammable ſubſtances, as of wood, pit-coal, &c. in great cities, muſt phlogiſticate, diminiſh, and render noxious the atmoſphere of ſuch places. That this happens, in ſome degree, cannot be denied; but, when we conſider, that the conſtituent phlogiſton of inflammable bodies in the ſtate of fiery decompoſition, carries with it, in powerful attraction, other conſtituent principles of the burning matter, in the form of ſmoke, which is ſoon condenſed into ſoot, we ſhall find that the atmoſphere does not receive ſo much phlogiſton from fires and lights, as, at firſt ſight, one might have imagined.

It is believed, by learned men of the preſent age, that moiſture in the air is the *principal and main pre-diſpoſing cauſe* to ſcurvy. This is certainly unfounded. Simple moiſture, watery vapour, can in no way be a cauſe of ſcurvy: if it were ſo, people in a manner, immerſed in watery vapour, from their callings, and people expoſed to the fogs of Newfoundland, would, one might imagine, certainly become highly ſcorbutic. In reſpect to Newfoundland, while ſurgeon to one of his Majeſty's ſhips upon that ſtation, I do not recollect any inconvenience having ariſen from ſcurvy; though the atmoſphere to a conſiderable height, is, in general, ſo loaded with watery vapour, that one can hardly diſtinguiſh an object at the diſtance, frequently, of only 100 yards from the ſhip. But, on that ſtation, the people are ſupplied with a liquor impregnated with vegetable fixed air, viz. ſpruce beer, for their common drink. If, however, a moiſt air be ſuperphlogiſticated, it cannot be ſo fit for the purpoſes of animal life.

Damp, wet cloathing and bedding, and lodging in a ſhip, will not produce ſcurvy. It is ſaid, ſuch circumſtances cauſe a moiſt, ſtagnating, confined, air within a ſhip, which becomes moſt offenſive and intolerable. Simple aqueous vapour could never produce theſe effects. Any air which is offenſive and intolerable muſt have been rendered ſo by other cauſes: ſuch air is highly noxious; ſuch air is not only ſuperphlogiſticated, but the phlogiſton is combined with putrid animal vapour, which will always cauſe diminution of common air, agreeably to the experiments of the great Dr. Prieſtley. It is certain, that animal life cannot ſubſiſt ſo perfectly in ſuch an air; and a fever, analogous to the plague, or gaol diſtemper, is more likely to ariſe from men breathing ſuch air, than the ſcurvy. Fiſhermen,

ermen, generally, in all countries, are wet; eſpecially upon the banks and coaſts of Newfoundland: but, I have not heard, nor did I ſee, that ſcurvy was the reſult: indeed, few men are more hearty and robuſt than the fiſhermen employed in the Newfoundland fiſhery.

Cold is reckoned a cauſe of ſcurvy; the more ſo if the air at the ſame time be moiſt. Dr. Lind eſteems cold and moiſture to be the moſt powerful predispoſing cauſe to ſcurvy. We have now ſo many proofs to the contrary, that it would be needleſs to recite them, or offer examples. If men in perfect health, be expoſed to any unuſual degree of natural cold and ſimple moiſture, while they are ſupplied with a proper diet of animal and vegetable food, the ſcurvy will not prevail amongſt them. If a moiſt air, indeed, be ſo cold as to rob the animal of its vital phlogiſton, the conſequence would aſſuredly be fatal: death would immediately enſue, but not from ſcurvy. A cold and moiſt air imbibes phlogiſton very powerfully and copiouſly indeed. There is a peculiar kind of denſe fog obſerved in ſevere froſty weather, which feels remarkably cold: the air in this ſtate is highly diſpoſed to imbibe or combine itſelf with phlogiſton.

If a perſon be expoſed to a ſufficient degree of what we commonly underſtand by the word *cold*, the living principle will be gradually extinguiſhed. The animal ſo treated will be deprived of all its heat, and all its volatile or vital phlogiſton. This vital phlogiſton is chiefly confined to the brain, the cerebellum, ſpinal marrow, and nerves. It is remarkable, that phlogiſton does not appear to enter into the conſtitution of brain, or nervous medullary ſubſtance. Brain is altogether uninflammable in a red heat, whence it is certain there is no animal oil, or fat, in its compoſition.

In reſpect to the conduction of electricity, Dr. Prieſtley ſays, "I may venture to lay it down as a characteriſtic diſtinction between conducting and non-conducting ſubſtances, that the former contain phlogiſton intimately united with ſome baſe, and the latter, if they contain phlogiſton at all, retain it more looſely."

The vital phlogiſton is alledged to be a modification of electric matter; or, rather, the latter is a modification of elementary phlogiſton as well as the former. Now, if vital phlogiſton and electricity be ſimilar, the paſſage I have juſt quoted would make it appear that the nervous ſyſtem is incapable to conduct electricity or vital phlogiſton, inaſmuch as phlogiſton does not enter into the compoſition of brain. But we have much reaſon to believe the contrary, in reſpect to vital phlogiſton.

The marine acid has a ſtrong affinity with phlogiſton. Common ſalt, mixed with ſnow, produces a greater degree of cold than the ſnow indicated: alſo a ſolution of ſal armoniac in water produces cold. The marine acid attracts, or combines itſelf with, whatever phlogiſton the ſnow or water could impart, with which it forms a new compound. It cannot be expected, that in this ſtate it ſhould ſhew itſelf as phlogiſton. Sulphur contains phlogiſton in great abundance, but then the phlogiſton is ſo modified in this combination, that ſulphur ſeems as cold as any other ſubſtance of equal denſity.

Common ſalt in preſerving meat from putrefaction may do it in conſequence of its imbibing, or *fixing* the phlogiſton of the meat.

Doctor Watſon, in his chemical eſſays, gives a hint for the decompoſition of common ſalt with a view to obtain natron, or the mineral fixed alkali. I made a violent red fire of pit-coal in the ſmall drawing ſtove of a parlour. The chimney was narrow, and the fire burned vehemently. I ſprinkled by degrees upon this fire about two pounds of common ſalt. The copious, denſe, white fumes, and blue flames, were beautiful indeed. When I thought the purpoſe might be effected upon the ceaſing of the fumes, I ſuffered the fire to burn out. Lifting up the *blower* of the ſtove, and looking up the chimney, I was rather ſurprized to ſee, as far up as I could diſcern, the whole ſurface covered with white matter. This appearance muſt have been produced from the union of the marine acid with the phlogiſton of the fire. I threw my aſhes into water, which I filtered and evaporated, when I obtained part of the common ſalt which I had ſprinkled upon the fire. There was no natron.

I made this experiment in the month of June. It is to be remarked, that a tree in the garden ſuddenly loſt all its leaves. This tree was expoſed to the white fumes, which iſſued out of the chimney in vaſt abundance. Quere, Was this phenomenon occaſioned by the marine acid depriving the leaves of the tree of their phlogiſton?

Nitre, given in inflammatory diſeaſes, is of great uſe, inaſmuch as its acid may imbibe, or combine itſelf wlth the phlogiſton of animal heat; of which, in inflammatory caſes, there appears to be a ſuperabundance. We know the great affinity there is between the nitrous acid and phlogiſton.

The *calces* of metals appear to be highly diſpoſed to imbibe phlogiſton. Quere. Is the extract of ſaturn of uſe for this reaſon in topical inflammation? if ſo, as the calx of lead ſoon acquires an additional weight, would it not be more efficacious if uſed before it has had time to become heavier?

Living heat, or animal heat, and vital phlogiſton, are very different things. Animal heat is diffuſed throughout the body in conſequence of the circulation of the blood. How living heat is generated, God knows. In a limb completely *froſt-bitten*, in conſequence of its having been robbed of all its ſenſible or warm phlogiſton, there is not only a ceſſation of the circulation of the blood, but the vital phlogiſton, or nervous influence is no longer propelled; the conducting power of the nerves of ſuch limb would appear to have ſuffered ſome change; whence the limb continues cold and paralytic, and, in fact, is dead.

Animal heat, in a part, would appear not to depend upon the nervous influence being propagated in that part; for, in palſy, the animal or living heat of the diſeaſed limb will be found equal to that of the ſound limb. Animal heat would appear to be always increaſed in proportion to the increaſe of the circulation of the blood. Animal heat does not depend upon muſcular action, that of the heart excepted. In inflammatory fever, while the moving or muſcular ſyſtem is inactive, the animal heat is increaſed. Animal heat, and that heat which is produced by the friction, motion, percuſſion of dry ſolid bodies, would appear to be different relative to their cauſe.

But to return. If ſeamen and officers have conſtantly dry cloathing and lodging, on ſhipboard, while they are deprived of ſuch diet and drink as yield the vegetable principles, they will moſt aſſuredly be ſooner or later attacked by ſcurvy.

A ſquadron of his Majeſty's ſhips, under the command of Rear Admiral Graves, ſailed from Plymouth Sound in the month of May, 1780, for North America. I was ſurgeon to one of theſe line of battle ſhips. We croſſed the Atlantic Ocean, for the greater part, in about the latitude of 30 degrees, north. The weather, during the whole paſſage, was remarkably fine and dry. No people could be more healthy than the crews of all the ſhips of this ſquadron, while they drank the ſhip's ſmall beer.

When the beer was expended, the people were ſerved with rum and water. In a ſhort time thereafter the ſcurvy began to ſhew itſelf. It prevailed rapidly on board of our ſhip, and we loſt ſeveral men. When the ſhip arrived off Sandy-Hook, we had about one hundred men miſerably afflicted with the true marine ſcurvy. The other ſhips ſuffered in proportion. The bark, the elixir of vitriol, the eſſence of malt, were of no ſervice. I remarked, that the freſh, hale, country young men, who had entered as landſmen and marines, and who had never before been to ſea, ſuffered moſt; the ſcurvy ſpread rapidly throughout their ſyſtem.

Moiſt ſea air, Dr. Lind ſays, is rendered ſtill more noxious by ſtagnation, whereby it loſes its elaſticity, and is prejudicial to animals, and more ſo where ſtagnating water is pent up along with it; and it is heated in ſhips by paſſing through the lungs of many people, and impregnated with various effluvia.

Now, I would obſerve, that the common air by ſtagnation, will be affected according to the nature of the ſubſtances with which it is in contact. As matter in general would ſeem to be always in a ſtate of change, ſome ſubſtances will diminiſh common air, while others render it more pure. Some ſubſtances, as animals, will diminiſh its good qualities by excrementitious vapours, while others, as growing vegetables, are purifying it by abſorbing ſuch excrementitious vapours. In a ſhip, and in every cloſe place which is crouded, the common air will become leſs pure; more impure if many candles be conſtantly burning between decks and in cabins, &c. below. Air in a ſhip at ſea, is likely to be leſs purified than air in country houſes; for Dr. Prieſtley has proved, that vegetables (during a certain period of their growth) abſorb the noxious qualities of air. Such a mode of the purification of air cannot, of courſe, exiſt at ſea. But, as Dr. Prieſtley has alſo found that pure water imbibes impure qualities of air, the ocean is ſuppoſed uſeful in this view: and more ſo, perhaps, than freſh water.

Mere ſtagnation will not render the common air noxious. A very clean and dry bottle filled with common air, and hermetically ſealed, will preſerve ſuch common air for ever; but if any active vapour were admitted,

mitted, the quality of the common air would be changed.

Acid, and alkaline air, produce phenomena upon the ſame principle as alkaline ſalts and acids do. An acid air and an alkaline air will effervefce in the act of union, exhibiting various coloured fumes, and ſometimes effloreſcences. Volatile alkaline fumes, expoſed to nitrous air and common air mixed, cauſes white clouds; the nitrous vapour uniting with the alkaline fumes, while the common air receives the phlogiſton with which the vapour of the nitrous acid was combined.

I have found that the vapour or fumes of the nitrous acid diminiſh the heat of the common air. Is it not probable that the fumes of the nitrous acid combine with the aërial phlogiſton?

Nitrous air added to, or mixed with, common air, effervesſces with one or other of the conſtituent principles of common air; and this effervesſcence and diminution of the quantity ſeem to be in proportion to the purity of the common air. Nitrous acid has a ſtrong affinity with phlogiſton. Is it poſſible that the nitrous acid fumes ſhould have a greater affinity with the aërial phlogiſton, than with the phlogiſton of metals? If ſo, nitrous air may decompoſe common air by uniting with the aërial phlogiſton, while ſome conſtituent principle of common air imbibe or unite with, the metalline phlogiſton.

Nitrous air, Dr. Prieſtley has found, will not efferveſce with inflammable air, nor with any kind of diminiſhed or noxious air; and all noxious air is ſuppoſed to be rendered ſo by foreign phlogiſton. Might we ſuppoſe that nitrous air efferveſces only with the aërial phlogiſton, or that peculiarly modified phlogiſton which enter into the conſtitution of common air? If a pint of nitrous air be added to one gallon of common air, there will happen an efferveſcence and an appearance of "a turbid red, or deep orange colour and a conſiderable heat;" that is, the nitrous acid decompoſes the common air in ſuch a way as to unite with the aërial phlogiſton, ſetting looſe fixed air, which is a conſtituent principle of common air. The whole qnantity of air thus treated has been found by Dr. Prieſtley to be diminiſhed more than one third. How ſhall we account for this diminution of common air by its having been mixed with, and decompoſed by, nitrous air? Is aërial phlogiſton the cauſe of the ſpring, the elaſticity, and expanſive power of the atmoſphere? But, indeed, principles decompoſed cannot be imagined to be capable to ſhew the ſame phenomena as when in a ſtate of union. In ſeparation they will act moſt oppoſitely. A neutral ſalt is formed by the union of an acid and an alkaline ſalt. Which qualities can be more different than acid and alkaline? and how different is a neutral ſalt from either an acid ſalt or an alkaline ſalt.

The fact would appear to be this: nitrous air, conſiſting of the nitrous acid fumes ſaturated with metalline phlogiſton, obtained by pouring nitrous acid upon metals, mixed with the common air, the phenomena take place for this reaſon; becauſe the common air having a greater affinity with the phlogiſton of the metal than the nitrous acid fumes have, powerfully and inſtantaneouſly abſorbs, imbibes, or unites with it. It appears probable, that in this proceſs, the common air lets looſe its fixed air, as is the caſe when inflammable or putrid air is mixed with common air. If ſo, fixed air would appear to be the principle of elaſticity in common air; for, when common air lets looſe fixed air, it becomes diminiſhed. How expanſive does fixed air become in bottled beer, &c.! Nay, is fixed air common air condenſed? I believe water is incapable of decompoſition. Is it ſo with common air? Water becomes poiſonous when poiſonous matter is mixed or diſſolved in it: and the common air will become noxious if noxious fumes, vapour, exhalations, be mixed with or diſſolved or diffuſed in it.

Plants live in inflammable air, and thrive wonderfully in putrid air, according to the experiments of the great Dr. Prieſtley. But, plants will not live in air deprived of phlogiſton. I have had plants in pots of earth at ſea: Whenever the ſpray of the ſea fell upon their leaves they died quickly. The marine acid, I apprehend, robbed the plants of their conſtituent phlogiſton. Plants will die in nitrous air, and in common air which has ſuffered diminution, or decompoſition by nitrous air. Metalline phlogiſton is perhaps unfit for vegetable nouriſhment.

A principle, an element, may be modified; but, can a principle, or an element be decompoſed? I ſhould think not.

Further, in reſpect to the nitrous acid. The nitrous acid, not only combines itſelf with fiery phlogiſton, but diſlodges and forms an union with it in its fixed and cold ſtate. The nitrous acid forms an inſtantaneous union with the phlogiſton of ſulphur and charcoal in the burning of gun-powder. The nitrous acid attracts the cold fixed phlogiſton of metals, thereby decompoſing them. Might not the nitrous acid, diluted, be more uſeful in inflammatory caſes than nitre, to abſorb ſuperabundant phlogiſton? Yet, if what I conceive to be the caſe be founded in reſpect to neutral ſalts formed by the marine, nitrous, and vitriolic, acids, combined with alkaline baſis, it is a matter of no great moment. The marine acid, the nitrous acid, the vitriolic acid, have a ſtrong affinity with phlogiſton; more ſo than with alkaline baſis. I conceive when ſea water or ſalt water is taken in that quantity which will purge, or in any quantity, the ſea ſalt is decompoſed; that is the marine acid quits the natron, its baſe, and combines itſelf with animal phlogiſton. Thence the uſe of, and advantage from, ſea-water, or ſea-ſalt, in certain inflammatory caſes. The alkaline baſis of ſea-ſalt, I think, neutralizes itſelf by an union with ſome acid in the animal body, and proves purgative.

Glauber's ſalt, or that neutral ſalt formed by an union of natron or the baſis of ſea ſalt, and the vitricolic acid, I conceive to undergo a ſimilar proceſs, and to produce ſimilar effects. Whence alſo the uſe of Glauber's ſalts in inflammatory complaints.

I would ſay the very ſame of nitre, only with this difference, that ſalt-petre is ſeldom given in ſuch quantity as, when its baſis (fixed alkaline ſalt) is neutralized, or, ſaturated, with an animal acid, to purge.

Whence is it that ſea ſalt and ſaltpetre preſerve fleſh from putrefaction? as I have obſerved, becauſe the marine acid of the former, and the nitrous acid of the latter, would appear to combine with, or to fix, the phlogiſton of the meat: for, it would appear, that putrefaction is the conſequence of the conſtituent, or fixed phlogiſton, and fixed air, of animal and vegetable matter becoming active, volatile and expanſive; and, undergoing a different modification, they detach themſelves from other conſtituent principles of animals and vegetables, and eſcape into the common greedy receptacle, the atmoſphere. Animal ſubſtances begin ſoon to decompoſe or putrefy in warm climates; and when that proceſs once begins, it is no eaſy matter to check it; whence the great difficulty, by common means, to preſerve animal ſubſtances from putrefaction in warm countries, or, in hot and ſultry weather.

Unleſs aliment ſupply phlogiſton and fixed air, it cannot nouriſh nor preſerve animals alive. It is in conſequence of vegetable phlogiſton in graſs, hay, oats, &c. that ſheep, deer, oxen, horſes, &c. become fat: and it is in conſequence of the ſame principle animalized, and vegetable fixed air, which the above ſubſtances yield, that animals are muſcular and powerful. In proportion as hay abound with its conſtituent phlogiſton, the more valuable it is eſteemed. Well preſerved old hay is for this reaſon always dearer than new hay. One ton of old hay may be worth two tons of new hay in point of nouriſhment. Old hay has loſt its watery parts which made great part of its bulk and weight when new. Old hay, well preſerved, retains, in great abundance, phlogiſton and fixed air.

Old people require a greater ſupply of phlogiſton than young people; but this ſupply of phlogiſton ſhould be obtained rather from aliment in the courſe of digeſtion than from liquors highly charged with phlogiſton; as wine, brandy, rum, &c.

Vegetable food is far leſs nouriſhing than animal food. Animal food is vegetable principles animalized; conſequently a leſs quantity of animal food will nouriſh men than a greater quantity of vegetable food: wherefore, where quantity and *flatulency* offend, animal food is to be preferred, in all caſes where quick nouriſhment is required. Animal food moreover, is more eaſy of digeſtion than vegetable aliment in general. Animal food communicates the vegetable principles *animalized* quickly, and in greater abundance, than vegetables can poſſibly communicate them in the courſe of their digeſtion and aſſimilation in the animal body. For this reaſon, the drink vulgarly called *Flip*, viz. brandy or rum mixed with beer highly impregnated with fixed air, is a moſt nouriſhing drink, and ſudden cordial in caſes of fatigue and debility from any exceſs of bodily orgaſm. I purpoſely omit to mention eggs and ſugar, &c.

commonly added to this drink*; but I would juſt deſire that the beer might not be heated; otherwiſe the vegetable fixed air would all eſcape, and the liquor would become flat and vapid. Such a drink, with all the ingredients if you will, I conceive to to be highly proper in old age; provided always in every caſe of this kind, the liquor be neither too ſtrong nor taken in too great a quantity, nor too frequently repeated. The abuſe of any bleſſing renders it a curſe. The abuſe of wine and ſpirits, or inebriating liquor, is tedious, but infallible ruin, and ſelf-murder.

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* Becauſe I confine myſelf to the nouriſhing vegetable principles, phlogiſton and fixed air; the former in the ardent ſpirit, and the latter in the beer.

The great and celebrious Dr. Prieſtley ſays, "I cannot help flattering myſelf that, in time, very great and medicinal uſe will be made of the application of theſe different kinds of air to the animal ſyſtem. Let ingenious phyſicians attend to this ſubject, and endeavour to lay hold of the new *handle* which is now preſented them, before it be ſeized by raſh empiricks; who, by an indiſcriminate and injudicious application, often ruin the credit of things and proceſſes which might otherwiſe make an uſeful addition to the *materia* and *ars medica*." The Doctor previouſly ſays, "being no phyſician, I run no riſk by ſuch propoſals as theſe."

In reſpect to myſelf, I would beg leave humbly to ſignify that, being neither phyſician nor quack, I *hope* to run no riſk by what I ſhall have obſerved, and cauſed to be printed and publiſhed upon the ſubject. Being but a gentleman ſoldier in the ranks of the medical army, I hope no commiſſioned officer will ſhake his cane over the head of a poor *private* for preſuming to *think*, and to deliver opinions relative to his profeſſion.

I have the honour to know Dr. Prieſtley but from his writings; where I clearly diſcover a *mind* too great to be offended at any thing I ſhall have ſaid; and where I plainly perceive a *heart* too benevolent *not to ſoften* and *pardon* the errors, the inadvertencies and the ignorance of a brother ſubject and fellow creature.

In reſpect to the medical application of the various kinds of *factitious* air, I would obſerve, 1. That in caſes which require fixed air, viz. *putrid* caſes, it appears to me, that the beſt way to adminiſter fixed air will be found to be by liquors highly impregnated with fixed air in conſequence of the vinous or ſpirituous fermentation. I would prefer ſuch liquors to any water charged with the fixed air of minerals. Beer ſo briſk that it burſts bottles will effectually convey more genuine vegetable fixed air into the bowels than any other contrivance. I would rather, at all times and occaſions, wiſh to evacuate putrid fœces from the ſyſtem, than ſaturate ſuch noxious matter with fixed air. If it ſhall ever be judged neceſſary to inject fixed air into the bowels, I think it ſhould be communicated by ſuch liquor as I have mentioned. Perhaps an injection of freſh yeaſt might do great good; eſpecially if gangrene be apprehended. It muſt be obſerved, that all liquors highly charged with fixed air from fermentation ought to be adminiſtered quickly in their natural cold ſtate. The application of heat would expel their fixed air.

2. Inflammable air. In caſes of ſudden or apparent death, inflammable air might be injected into the inteſtines: and, here, as a deſperate caſe often requires a deſperate remedy and treatment, if we could cauſe inflammable air to fire and explode, I know not what might be the conſequence. Upon the whole,

it would appear, we are in poſſéſſion of more eligible and more effectual ſtimulants. Electricity might be more ſucceſsful.

3. *Nitrous air*; or, the fumes of the nitrous acid charged with the phlogiſton of metal. I cannot very clearly diſcover how nitrous air may operate. If nitrous air be injected, I ſhould apprehend ſome ſudden decompoſition of it. I would truſt more to the nitrous acid given in a diluted ſtate; or to nitre itſelf, in all caſes where nitrous air might be uſeful. We have certainly more eligible ways of giving phlogiſton. I apprehend the phlogiſton

giſton of metals would be prejudicial, inſtead of being ſalutary, to the animal conſtitution.

4. *Marine acid air.* I would prefer the acid diluted in water. It will be found in able, judicious, and diſtinctive hands, a moſt valuable remedy in inflammatory and real putrid diſtempers. The marine acid, or its fumes, abſorb phlogiſton moſt powerfully indeed; whence it will abate inflammation, and check any tendency to animal putrefaction.

The fumes of the marine acid combined with the phlogiſton

giſton of certain vegetable matter, ſmells in a peculiar manner, which is ſuffocating and offenſive in the higheſt degree. Such fumes prevail in great abundance on board of Weſt-India ſhips in the ſugar trade. The drainings of molaſſes from the new ſugar mix with the ſalt water in the ſhip's well, where, fermenting, the marine acid combines itſelf with the phlogiſton of the ſaccharine matter. Theſe fumes ariſe copiouſly, and are diffuſed throughout the ſhip. The ſurfaces of all expoſed ſolids in the ſhip are tinged with theſe fumes; ſo that every thing looks as if it were coloured with ſome ſhining black lead.

With a view to correct bad air in a ſhip, and to deſtroy infectious matter, a cuſtom prevails in his Majeſty's navy to burn combuſtible ſubſtances between decks, &c. to fire gunpowder, to deflagrate ſaltpetre, with burning charcoal, &c. Now, from all the experiments of Dr. Prieſtley, it would appear, that ſuch a practice muſt render bad air worſe. A candle will not burn in air in which gunpowder has been fired: and if the ſame bad air were always to remain in a ſhip, by ſuch a treatment it would be rendered very noxious indeed. But, as in every confined place containing many men, there muſt be a continual ſupply of freſh air, admitting the above practice to do good, how ſhall we detain the air we ſuppoſe thus to be purified? If, during a windy day, a man make a fire upon the top of a hill, and tell me he does ſo to purify the air about him, ought I not to pity his head?

But, and it is a happy and moſt valuable diſcovery, Dr. Prieſtley proves demonſtratively, that by agitating the moſt noxious air of any kind in water, the noxious air is purified.

fied. Inſtead, therefore, of burning tar, pitch, old rope, charcoal, ſaltpetre, gunpowder, &c. in ſhips of his Majeſty, or in other ſhips, if a machine were contrived to diſperſe water in beautiful ſhowers, between decks, and in confined places, where no injury thereby might be done to ſtores, the air in ſuch places would, *pro tempore*, be rendered pure; after which, the water having been dried up, the ſurfaces of ſolids may be bathed or moiſtened, or done over with ſome ſtrong acid; acids, eſpecially having a great affinity with phlogiſton. In their concentrated ſtate, however, ſuch acids would injure the conſtitution of many ſubſtances; this is to be obviated by diluting them with water.

That there muſt be a conſtant ſupply of freſh air in a ſhip, containing men, is very certain: and that men and burning candles conſume, or, rather, render noxious, a vaſt quantity of common air, is equally true.

As every man, and every burning candle conſumes about one gallon of common air in a minute, if a ſhip contain one thouſand men, one thouſand gallons of common air will be rendered noxious by theſe men every minute, and ſixty thouſand gallons of freſh air will be required every hour for their preſervation. A prodigious quantity indeed; beſides the air conſumed by burning candles and live ſtock, which will be in proportion to the numbers reſpectively. How dangerous, how dreadful muſt it be, where many men are ſhut up within the ſcanty limits of a ſhip, even in the pureſt ſtate of the common air; how much more ſo muſt it be while the atmoſphere is ſuper-phlogiſticated and charged with watery vapour? Peſtilence, in ſuch circumſtances, may be apprehended; or, which is tantamount, a rapid tendency to putrefactive decompoſition of the animal conſtituent principles, when the vital powers vaniſh quickly and ſadly indeed. For which reaſons ſhips cannot be conſtructed too large and airy, in this view. When it happens in ſtormy weather, or from any preſſing occaſion, that the ſhip's hatchways are obliged to be ſhut up and *battoned* down, too much attention cannot be beſtowed to ſweeten the ſhip immediately afterwards. Even at times, when the hatchways have been uncovered, I have ſeen, in line of battle ſhips, in the morning, the frames of the hatchways covered with a kind of mouldy effloreſcence, occaſioned by the breathing of the men below. Fixed air cauſes a mouldy effloreſcence.

When I was ſurgeon to his Majeſty's ſhip Conqueſtadore, then ſtationed at the Nore, to receive impreſſed men from tenders, &c. I have received poor wretches under my care by the tender from the Tower, in the moſt pitiable condition. The method is to ſhut up ſixty or eighty ill-fated mortals in the hold of a ſmall veſſel, where they are ſometimes, as it were, ſtowed *in bulk*. The hatchway, if the men become *troubleſome* for want of common cool air, is at times, hermetically ſealed. As they are not ſuffered to come upon deck, to anſwer the calls of nature, there is a tub or a bucket placed below in the midſt of them. The effluvia from human excrement muſt, of courſe, add greatly to the miſery of *Britons* ſo treated. Under ſuch circumſtances many faint, and ſome die: others have been received on board the guardſhip with fever that has immediately exhibited putrid phenomena, terminating in death. Theſe wretches, after having been 18 or 20 hours thus confined, look as if they had come out of the black hole of Calcutta, with cadaverous countenances, drenched with ſweat and the vapour of the breath, and reeking with heat. I have ſeen human nature undergoing ſevere diſcipline in various countries, barbarous and poliſhed; but I do not recollect to have ſeen my fellow creatures any where in a more unpleaſant ſituation, than I have ſeen the ſubjects of a nation ſo juſtly renowned for magnanimity, benevolence, and pity, on board *Britiſh* tenders. It is ſaid the urgency, the exigency of affairs require it. It may be ſo; and I bow down with reverence, though unconvinced. O for the purſe and the *power* of an abſolute monarch, and a royal mandate to travel throughout his dominions in queſt of human

man woe; to ſaturate the wants of wretchedneſs, in ſtations beneath the notice of *unfeeling* affluence and gaudy *giddy* blazonry; and, above all, O for the purſe and power of Majeſty, to reward, in the *gentleſt* and moſt *delicate* way, that *ſuffering* glory of humanity, which, like Patience on a monument, *ſmiling* at grief, *nobly* periſhes in ſome lone retreat, a triumphant and ſplendid ſacrifice to the dignity of our nature, rather than ſay *thank you*, to all the monarchs upon earth.

Dr. Lind ſays, " an additional, and extremely powerful cauſe, obſerved at ſea to occaſion *ſcurvy*, and which, concurring with the former, in progreſs of time, ſeldom fails to produce it. And this is, the want of freſh vegetables and greens; either, as may be ſuppoſed, to counteract the bad effects of the before-mentioned ſituation of ſeamen; or rather, and more truly, to correct the quality of ſuch hard and dry food as they are obliged to make uſe of. Experience, indeed, ſufficiently ſhews, that as greens, or freſh vegetables, with ripe fruits, are the beſt remedies for it, ſo they prove the moſt effectual preſervatives againſt it. A want of them at ſea, together with a long confinement within the narrow limits of a moiſt damp ſhip, are the true cauſes of its ſo general and fatal malignity upon that element."

When Dr. Lind wrote his thoughts upon this diſeaſe, the Scurvy, the pneumatic diſcoveries of Dr. Prieſtley were not publiſhed. If I had not read and underſtood Dr. Prieſtley's writings, and repeated, and perhaps varied many of his experiments, relative to the different kinds of factitious air, whatever I might have publiſhed upon the ſcurvy would have been greatly inferior to the obſervations of Dr. James Lind. Indeed, even now, whatever may deſerve attention throughout theſe pages, can confer no merit upon me; for I am indebted to the works of Dr. Prieſtley for the greater part, the *eſſential* part of the knowledge I may be allowed to have upon the preſent ſubject. If I had not read his book, I ſhould never have written what this little book contains. I hope I ſhall not have done it altogether in vain.

Freſh vegetables, greens, and ripe fruit, will effectually prevent and cure the ſcurvy: but the ſcurvy will be effectually prevented and cured, without freſh vegetables, without greens, and without ripe fruit. But the ſea ſcurvy cannot be prevented, nor cured, without the vegetable principles, viz. vegetable fixed air and vegetable phlogiſton. Whatever vegetable ſubſtances, or liquors, abounding with fixed air, be moſt diſpoſed to part from their fixed air; when taken into the bowels; are the ſubſtances and liquors which will have the greateſt and quickeſt efficacy in the prevention and cure of the ſcurvy.

Vegetables and fruit are of uſe in the prevention and cure of ſea ſcurvy in proportion as they abound with fixed air and phlogiſton, and as they be diſpoſed to yield thoſe principles in the ſtomach. Although flour abound both in fixed air and phlogiſton, yet flour, in the forms of ſea biſcuit, ſuch as the King's ſhips are ſupplied with, and ſea puddings, lays heavy upon the ſtomach, becauſe it does not readily digeſt, or decompoſe or yield up its conſtituent principles by that kind of fermentation which takes place in the human ſtomach, unleſs it meet with ſome proper yeaſt or ferment in the ſtomach, when it will quickly digeſt or be decompoſed. Without fermented liquors, or liquors highly charged with fixed air by fermentation; or without vegetables and fruit; in ſhort, without vegetable fixed air, as a ferment, ſea biſcuit and puddings are very indigeſtible in the ſtomachs of ſeamen, eſpecially if they be afflicted with ſcurvy. The ſame obſervation is applicable to many vegetable ſubſtances which will not decompoſe in the ſtomach, though we well know they abound with fixed air and phlogiſton in the courſe of the vinous or ſpirituous fermentation. The eſſence of malt, for this reaſon, ſimply diſſolved in water, and taken into the ſtomach, will by no means readily yield up its fixed air and phlogiſton: but, if we diſſolve eſſence of malt in water, and add ſome yeaſt to the ſolution, a vaſt quantity of fixed air will ſeparate, become elaſtic, and fly off the fermenting liquor, which becomes highly impregnated with fixed air. It is in this manner that eſſence of malt ought to be treated and uſed on board his Majeſty's ſhips.

Sugar, which, I think, abounds more in vegetable fixed air and phlogiſton than any other vegetable ſubſtance I know, except oil and turpentine, will not, in any conſiderable degree, part from its fixed air in the ſtomach ſpontaneouſly;

but no ſooner do we melt ſugar in water and add yeaſt to the ſolution, than the fermentation, decompoſition, and diſcharge of its fixed air take place. In this operation, though the phlogiſton be detached, it does not fly off like fixed air. It appears to acquire a new mode, and unites with the water, thereby rendering it ſpirituous.

We have been taught by Dr. Prieſtley to impregnate water with fixed air obtained from chalk, by the vitriolic acid. Water thus impregnated, has been found not only to poſſeſs the qualities of the Pyrmont and Seltzer waters, but even to ſurpaſs them in flavour and brilliancy. For my own uſe I impregnate water with fixed air in another manner, which I ſhall mention by and by.

The late Dr. Hulme has recommended fixed air for the prevention and cure of the ſea ſcurvy. He adviſes the medical gentlemen, and others, at ſea, to have in readineſs an alkaline mixture of water and ſalt of tartar, and an acid mixture of water and the weak ſpirit of vitriol. He directs a certain quantity of each of theſe mixtures to be taken into the ſtomach ſeparately, the one immediately after the other, ſo that in the ſtomach they may effervesce and diſcharge fixed air.

I am not certain that it is ſo; but I think I have perceived the mineral fixed air and the fixed air obtained from vegetable matter to be different in flavour and taſte. I am certain that equal quantities of the ſame kind of water equally impregnated, the one with fixed air obtained from chalk and oil of vitriol, and the other with fixed air from a fermenting liquor, differ widely in ſmell and taſte. Vegetable and mineral fixed air may only differ in modification.

I impregnate water with fixed air in the following manner. I have lately been in the habit of drinking a ſmall fermented liquor made from ſugar. I diſſolve fifteen pounds of ſugar in ten gallons of water, and ſet the mixture to ferment in a ten gallon caſk. I put about half a pint of yeaſt to the whole. When the fermentation has taken place, I adapt a bent tube to the bung-hole, in ſuch a manner, that all the generated fixed air muſt paſs through this bent tube. The other end of the bent tube is introduced and immerſed into a large bottle two thirds full of fair water. In twelve or twenty-four hours, the water in the bottle will be ſtrongly impregnated with vegetable fixed air*. But, finding that my *ſmall beer* made from ſugar contained fixed air in much greater abundance, I thought it quite unneceſſary, for my own uſe, to be at the trouble of impregnating water with vegetable fixed air in the above manner. I therefore draw off my liquor into bottles, which I take care to have well corked. When I draw a cork, I have not only good ſaccharine ſmall beer, but a moſt healthy and brilliant beverage for my common drink, highly charged with vegetable fixed air.

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* It is to be remarked, that the inſide of a glaſs tube uſed for this purpoſe, was coated throughout with yeaſt in 24 hours, although the perpendicular part of the tube, from the bung to the firſt bending, meaſured two feet. Quere, Is yeaſt fixed air condenſed? or, rather, can fixed air be modified into yeaſt?

One might imagine, that as fixed air is obtained by pouring oil of vitriol upon chalk, in water, that the vinous or ſpirituous fermentation, is an efferveſcence reſulting from the operation of a ſimilar proceſs. This is a mere looſe idea of my own.

Sea diet, or ſhip's proviſions, Dr. Lind ſays, are extremely wholeſome for labouring people, or perſons in perfect health, uſing proper exerciſe in a pure air; in ſuch circumſtances he adds, ſeamen will live upon it for ſeveral years without any inconvenience.

Certainly, provided ſuch labouring people, perſons in perfect health, and ſeamen, be properly ſupplied with vegetable principles, otherwiſe, as I have obſerved, they will be very liable to ſcurvy, in ſpite of proper exerciſe and pure air. It is of no moment whether theſe principles be ſupplied by vegetables themſelves, by fruit, or by fermented liquors. The latter will be found a perfectly adequate ſubſtitute for the former.

I have always obſerved, ſays Dr. Lind, that the ſcurvy increaſed in violence, upon the ſhip's ſmall beer being exhauſted and having brandy ſerved in lieu.

This is a truth confirmed by the death of thouſands of brave men; many of whom, if they had been ſupplied with vegetable principles, would have been now alive and merry; ever ready to ſtand forth in the defence of their king and country. Alas, magnanimous ſouls!

The ſea diet, in general, ſays Dr. Lind, is extremely hard of digeſtion: it conſiſts of two articles, viz. unfermented, mealy, or farinaceous ſubſtances and ſalted or dried fleſh and fiſh. Sea biſcuits, glutinous paſty, puddings, ground oats boiled in water, boiled peas, ſalt butter and cheeſe. No perſon, the Dr. obſerves, can live long on a diet of ſuch ſalt fleſh meats, unleſs it is corrected by bread, vinegar, or vegetables.

Beer and fermented liquors of any ſort, ſays Dr. Lind, will be found the beſt antiſcorbutic remedies, and moſt proper to correct the ill-effects of a ſea diet and ſituation; whereas diſtilled ſpirits have a moſt pernicious influence on this diſeaſe.

A vegetable ferment is certainly neceſſary for the proper digeſtion and aſſimulation of ſuch ſubſtances in the human ſtomach. New fermented bread will anſwer in ſome, not ſmall, degree. Vinegar, though it correct tendency to putrefactive digeſtion, yet I have not found, in the courſe of ſome years practice on board his Majeſty's ſhips, that it anſwered as a preventative or cure, in any degree, which might authorize me to recommend it in the ſcurvy, ſo as to be relied upon.

New fermented bread and vegetables, ſo eſſentially required at ſea, in default of fermented liquors, it is inconſiſtent to ſuppoſe we can be ſupplied with upon the ocean.

The unfermented, mealy, or farinaceous ſubſtances; the ſea biſcuit, the glutinous puddings, the boiled peaſe, the oatmeal, contain the vegetable principles abundantly. They require nothing but vegetable fixed air from fermented liquors or vegetables, to render them eaſy of digeſtion; when they will yield up their conſtituent principles.

What Dr. Lind has ſaid above, concerning beer and fermented liquors, is, in brief, the ſure method of preventing and curing the ſcurvy on board ſhips, at ſea, or any where. Twenty folio volumes upon this ſubject, in a practical view, could not be more to the purpoſe. If the pneumatic doctrines of Dr. Prieſtley had been known to Dr. Lind, when he writ his very excellent book upon the ſcurvy, it would have appeared, probably, in a ſmaller compaſs, ſtill clearer, more philoſophical, more intelligent, and containing fewer doubts and round-a-bout enquiries.

Ardent ſpirit, as it tends powerfully to fix the conſtituent principles of vegetable matter and animal ſubſtances, muſt, ſurely, " have a moſt pernicious influence on this diſeaſe;" for, fixed air being wanting, it will impede the digeſtion of ſea aliments, and induce hectic fever.

Dr. Lind ſays, when ſeamen begin to ſuffer from the ſea diet, they long with the moſt craving anxiety for green vegetables and the freſh fruits of the earth; from which only relief can be had.

The former part of the above is generally known to be fact; but, the concluſion is ſo far unfounded, inaſmuch as fermented liquors, containing the vegetable principles, grant the ſame relief.

In Dr. Lind's book it is obſerved, that ſome thouſands of Saxons were cut off, at the ſiege of *Thorn*, by the ſcurvy. They had been expoſed to all its cauſes. This was a real ſcurvy; and no ſooner the gates were opened, and plenty of vegetables admitted, upon the ſurrender of the town, but the diſeaſe quickly diſappeared, after having occaſioned a very dreadful mortality.

New beer, ale, cyder, porter, wine or other fermented liquors, impregnated ſtrongly with fixed air, and charged in ſome degree with vegetable phlogiſton, would have been found to have anſwered the ſame purpoſe: and this aſſertion perfectly coincides with what Dr. Lind has ſaid elſewhere.

In Lower Saxony, parts of Germany, Sweden, Denmark, and Norway, the ſcurvy is obſerved to be much leſs frequent than it was formerly; the face of all theſe countries, and the manner of their living, being much improved within theſe laſt 200 years. They now drink wine more freely, brew better ale, live in drier, and more airy, commodious houſes, and have greatly drained and improved their lands: notwithſtanding which, Dr. Lind thinks, that the *cold* of the climate muſt have certainly contributed a great deal towards the production of ſcurvy; for, ſays he, at Venice, whoſe ſituation is as damp as moſt places, the diſeaſe is unknown.

It is to be conſidered, that the Venetians drink wine, and eat excellent fruit. I have ſaid already, that cold and dampneſs will not produce ſcurvy; cauſes of a different nature are required to produce it.

In addition to my remarks upon *cold*, I introduce the following obſervations:

In clear, froſty weather, the atmoſphere of cold climates would appear to be highly in want of phlogiſton. How greedily does the common air receive the bluiſh flames, inflammable air, phlogiſton, from our fires, which burn with more than ordinary violence in a keen froſt, when the mercury is in a riſing ſtate; and how powerfully does the common air, in ſuch a ſtate, rob animals of their heat, eſpecially whoſe ſkins are not covered with hair, wool, or fur. Greaſe would ſeem to confine animal heat; whence a reaſon why fat people bear cold better than the lean and meagre. In a froſty day, while I walk, *ſhivering*, with a luſty gentleman, he ſhall be *puffing*, and wiping his face.

The fat of animals, done over upon the face, hands, &c. in froſty weather, would ſeem to confine the animal heat in thoſe parts, preventing delicate ſkins from chops, cracks, &c.

Oiled ſilk will confine animal heat effectually.

Hair certainly prevents animal heat in a great meaſure from flying off, upon the application of cold air. In cold, northern regions, the hair and fur of animals are free from greaſe externally. Quere, Do pomatum and hair powder favour the eſcape of animal phlogiſton from the head? I think they do; at leaſt, uſing both, my head feels as if it were ſo in very cold air. Hair perfectly clean and dry will keep the head warmer than hair emplaſtered with pomatum and hair powder, in my opinion;

but, be that as it may, philoſophy will politely yield, in ſuch caſes, to faſhion and habit.

When any excretion is checked, nature generally has a reſource. If accuſtomed perſpiration be checked by very cold weather, we are apt to make more water, and diſcharge more aqueous vapour by the lungs. In tender conſtitutions, in order, as much as poſſible, to ſpare the lungs, the body ſhould be kept warm; for which reaſon flannel ſheets, flannel ſhifts and ſhirts, flannel under-waiſtcoats, petticoats, &c. are peculiarly required during the cold and damp ſeaſons of this climate. Becauſe the Dutch obſerve this practice, it would appear that very few die of conſumption in that country, in proportion to the number carried off by it in Great Britain. The perſpiration from the ſurface of the body ſhould be always, in cold and damp countries, particularly encouraged. We ſhould, thence, accumulate animal heat, and, among other reaſons of greater conſequence, have leſs occaſion to meaſle and burn our ſhins by the fire-ſide.

Very cold air is, in many caſes, unfavourable to the reſpiration of animals. Very cold air greedily receives the phlogiſton and putrid effluvia combined therewith from the lungs of the reſpiring creature, but the excrementitious, aqueous vapour is not ſo readily and completely diſcharged. Very cold air does not receive ſuch vapour, ſo as to retain it in ſolution, as is the caſe in warm weather, when we cannot ſee the breath. In cold air the watery vapour comes out of the lungs in denſe fumes, which are not taken up in ſolution by the common air, but are condenſed and precipitated in it. Very cold air is capable to condenſe the watery vapour in the lungs. There is, in many conſtitutions, during very cold weather, an accumulation of ſuch vapour in the lungs; which vapour would ſeem to ſuffer a kind of coagulation, cauſing a degree of anxiety, oppreſſion, and cough, till it be expectorated in the form of phlegm, ſometimes tough and viſcid. Quere, Is ſuch coagulation effected by phlogiſton in the lungs? Lymph and ſerum coagulate by heat.

In ſuch a cold ſtate of the atmoſphere, all quieſcent matter whatever, upon the ſurface of the earth, in ſuch regions, is robbed in a greater or leſs degree, according to circumſtances of denſity, &c. of its heat, of that phlogiſton which does not immediately enter into the conſtitution of matter in a fixed mode. But, a cold atmoſphere would even ſeem to rob organized matter of conſtituent phlogiſton. The vernal blights, in conſequence of which, not only vegetables we eſteem tender, but alſo trees periſh, may, probably, be the reſult of either a defect of phlogiſton in the common air; or, the common air ſuddenly and powerfully attracts the phlogiſton of their buds and tender leaves: nay, the very trunk of the tree ſhall die by a blight. May a blight be owing to any acid vapour in the air, which have a ſtrong affinity with phlogiſton, as the marine acid, the *nitrous* acid, the vitriolic acid?

A ſhock of lightning is fatal to a vegetable or an animal, inaſmuch as, I conceive, it unites with and carries off, in an *electricity*-ſtate, the vital phlogiſton of the plant or of the animal.

The luſtre, and the life, and the eloquence of the eye, depend upon vital phlogiſton. In the moment of death we ſee the vital phlogiſton, as it were, vaniſhing from that organ. When the ſturdy, the honeſt ox, recoils, falling for ever, from the fatal ſtroke of the murderous hammer, how inexpreſſibly ſhocking it is to ſee his dying eyes! How changed!

There is a certain degree of energy peculiar to every organ of an animal in perfect health. If the energy of any one organ be diminiſhed, or increaſed, morbid phenomena will occur. If the energy of the ſtomach be leſſened, loſs of appetite and indigeſtion may be the conſequence. If the heart and arteries loſe their energy in ſome degree, a languid circulation and its conſequences, will prevail. If the energy of the brain be diminiſhed in any degree, the whole ſyſtem will be deranged. A perſon much depreſſed and exhauſted by labour ſits down with his friends over a bottle. He drinks of liquor containing much phlogiſton till he be half inebriated. In the progreſs of this refreſhment, we obſerve a gradual elevation of ſpirits, from dejection to a degree approaching to madneſs. He was unſtrung and feeble; he is now braced, powerful, and vigorous. He is all alive; he is, in fact, ſuperphlogiſticated vitally and corporally: he has an uncommon degree of muſcular exertion; the circulation of the blood is univerſally increaſed, and, of courſe, his animal heat. In this ſtate, the brain, cerebellum, and medulla ſpinalis; are overcharged with vital phlogiſton. The blood contained phlogiſtic materials in too great an abundance, and the ſecretion of vital phlogiſton was ſupernaturally copious; of which, any accumulation in the brain and cerebellum, beyond the natural quantity, might occaſion apoplexy and inſtant death. Every experiment of this kind injures the energy of the brain in particular; for, next morning, the poor man is quite deranged and unſtrung. In proportion as any machine is abuſed, its duration will be ſhortened; ſo it is with the human body: wherefore, if we deſire the continuance of health and long life, *exceſs* of every kind muſt be religiouſly avoided.

That the ſea diet, or the proviſions uſed at ſea, on board his Majeſty's ſhips, are ſuch as will not produce ſcurvy, provided the ſeamen be ſupplied with any *fermenting* drink or liquor abounding with *vegetable* fixed air, as beer, wine, cyder, &c. I am firmly perſuaded from a variety of experiments; but, if ſeamen upon ſuch diet be deprived of ſuch drink, the ſcurvy will certainly be the conſequence.

It hath been obſerved by many judicious men, beſides Dr. Lind, that the ſcurvy always increaſed in violence, when the ſhip's ſmall beer having been expended, brandy or rum was ſerved in lieu. Inflammable liquors, ardent ſpirit, vegetable juice highly charged with phlogiſton, and containing no vegetable fixed air, conſtantly aggravate all the ſymptoms which occur in the ſcurvy. But, if ſome brandy or rum be added to briſk beer, or fermented liquor, ſtrongly impregnated with vegetable fixed air, it will be found to be a very healthy drink for ſailors living upon the ſea proviſions. The reaſon, as

I have already hinted, why grog is ſo pernicious in the ſcurvy, is, becauſe in the tendency to univerſal decompoſition, throughout the ſyſtem, the brain excepted, a vaſt quantity of conſtituent or fixed phlogiſton is ſet looſe, becoming excrementitious, which proceſs ardent ſpirit is found to increaſe in a rapid manner in this diſeaſe, if vegetable fixed air be wanting: though this be not a philoſophical reaſon, yet it is as good, becauſe it is a fact. In the ſcurvy, phlogiſton is copiouſly diſcharged from the lungs in reſpiration, and by ſtool. The breath and the ſtools, in this diſeaſe, are inſufferably fœtid. Animal phlogiſton combined with animal putrid air, is, of all others, the moſt offenſive. If ardent ſpirit be uſed in this diſeaſe, without vegetable fixed air, the oppreſſed reſpiration and all the dreadful ſymptoms will be rendered more violent and fatal.

Seamen labouring under the ſcurvy, and living upon the ſea diet, have their minds greatly bent upon vegetables and fruit; they long exceedingly for beer, cyder, and wine. I have already obſerved, that relief in this diſeaſe may be effectually and abundantly procured without vegetables and fruit; and, that the ſame principles which vegetables and fruit yield are copiouſly contained in briſk fermented liquors.

In countries where the ſcurvy formerly made great havock, the diet, the manner of living, did not yield ſuch principles as were eſſential to the well being of the human body; for, it is obſerved, now that they drink good malt liquor, and wines, there is no ſuch thing hardly as the ſcurvy to be found amongſt them.

In reſpect to wine, I have found from conſiderable experience, that with ſea proviſions it will prevent the ſcurvy in a great meaſure, though not ſo powerfully and certainly as liquors more ſtrongly impregnated with fixed air, and containing leſs phlogiſton or ardent ſpirit. I have alſo found, that wine with the ſea proviſions will not cure the ſcurvy. In the advanced ſtage of the ſcurvy wine anſwered merely as a cordial; the diſeaſe would not yield to it. But I have found from certain experience, that briſk fermented liquors never failed to cure this dreadful and melancholy diſorder, if adminiſtered while the organs were yet in a ſtate to be reſtored by an acceſſion of conſtituent principles, ſo as to enable them to do their functions perfectly in a ſhort time.

I have hinted, that the ſea ſcurvy, the *proper* ſcurvy, is a tendency in the animal body to decompoſition or diſſolution.

The principle of coheſion ſeems to be vaniſhing, and the conſtituent principles of the animal fibre would appear to be diſpoſed to repel each other and eſcape.

That my reader, who may not have ſtudied in medicine, may form ſome juſt idea of this diſeaſe; and that he may be enabled to diſtinguiſh the real ſcurvy from a variety of complaints which vulgarly paſs for ſcorbutic, I ſhall beg leave to enumerate ſome of the principal ſymptoms of this diſorder.

An uncommon laſſitude or ſenſation of univerſal wearineſs, with averſion to exerciſe the moſt gentle. There is a dejection, a deſpondency and heavineſs throughout. The countenance is wonderfully changed. It looks pale, wan, yellowiſh, greeniſh, bloated, relaxed, and cadaverous, beſpeaking ſome ſad ſtate of the conſtitution. There is a feebleneſs and ſtiffneſs of the knees upon any attempt to walk: rigidity, hardneſs, and pain in the muſcles, of the lower extremities eſpecially, as if having proceeded from labour and much fatigue. There is a breathleſsneſs and univerſal debility and faintneſs upon uſing only a gentle motion of the body; which ſymptoms are always increaſed by walking up any aſcent. The gums ſwell, becoming ſoft, ſpungy and fungous; they are painful, and bleed upon the leaſt rubbing. They ſometimes become gangrenous, and ſeparate. The breath, in the advanced ſtate of the diſeaſe, is very offenſive indeed. The mouth, lips, and teeth in the morning, are frequently furred, and lined with a bloody, offenſive ſlime. The ſkin of the legs, thighs, &c. looks ſometimes like that of a gooſe newly plucked; at other times there are various coloured eruptions and pimples, bluiſh, reddiſh, yellowiſh, greeniſh, black, and purple. It ſhall be as frequently ſmooth, and gliſtening, often covered in the extremities and trunk, at uncertain diſtances, with broad ſpots, black and livid, as if having been occaſioned by blows from a ſtick, without wound. The ancles and legs become œdematous. In the courſe of the diſeaſe this ſwelling ſhall increaſe, and alter its colour, becoming oftentimes black; and the foot and leg of ſome perſons look as if abſolutely mortified. There are hard tumours and bumps about the lower extremities; and ſometimes upon the arms and upon the trunk of the body, of different colours and ſizes. There are various pains by day and by night, diſtreſſing and dejecting, eſpecially of the cheſt, with oppreſſed laborious reſpiration. Cartilage ſeems to be peculiarly affected in this diſeaſe; and, in advanced ſtates, the cartilages of the ribs become enlarged, and even ſeparate. There are hæmorrhages in this dreadful diſorder. There is often a griping, a purging, and ſymptomatic

ptomatic dyſentery, accompanied by vomiting in the latter ſtage; if ſtill no vegetable fixed air can be procured to prevent and remove theſe various diſtreſſing evils.

From the diſſection of a variety of bodies which died of this diſtemper, all the organs ſeemed to have ſuffered more or leſs, the brain excepted.

The veſſels, viz. arteries, veins, abſorbent veſſels, &c. ſeemed not only to have loſt their tone and texture, but were, abſolutely, in the extreme ramifications decompoſed; whence extravaſation of their contents, and accumulation thereof under the ſkin, in cellular membrane, in and about muſcles, in the ſheaths of tendons, and in cavities, as in the thorax, abdomen, &c.

I am now come to what I would humbly and moſt earneſtly recommend to the attention of the Government of Great Britain, in particular, and to the Public, univerſally.

In all countries where commerce prevails, it is acknowledged, that the marine, or true ſcurvy, is a diſeaſe which ariſes from the want of freſh vegetables, fruit, and freſh meat.

It is now eſtabliſhed as an incontrovertible fact, that freſh vegetables and ripe fruits are of uſe in preventing and curing the ſcurvy, *merely* in conſequence of the fixed air and ſome vegetable phlogiſton, which they impart and communicate to the animal body in the courſe of digeſtion.

It is a fact, equally incontrovertible, that liquors in a ſtate of vinous or ſpirituous fermentation, or liquors impregnated in a high degree with fixed air and ſome phlogiſton, in conſequence of the decompoſition of ſaccharine matter in, and abſorption of its principles by water, are as certainly (if not more) efficacious in the prevention and cure of the ſcurvy, as freſh vegetables and ripe fruits.

What I have to recommend is ſimple, cheap, and univerſally expedient.

During the courſe of a long voyage, whenever the ſhip's ſmall beer or wine ſhall be expended, let the common freſh water in caſks in the hold be converted into beer, in the following manner: let ſugar, or treacle, or melaſſes, in the proportion of, at leaſt two pounds of ſugar, or three or four pounds of melaſſes, or of treacle, be put to, or diſſolved in, every gallon of water which the cask ſhall contain; ſpace being always allowed in the cask for the room which the ſaccharine matter ſhall poſſeſs. Let ſo much yeaſt or freſh grounds of freſh beer be added as will cauſe the mixture to ferment, or work, in the courſe of a day or ſo. Let the fermentation go on ſome days, either with the bung out of the caſk, or the bung in, and the vent-peg out. At the expiration of eight or ten days, let the cask be completely ſtopped, ſo that no air may eſcape. If the mixture ſhall be ſuffered to ferment with the bung out of the cask, ſome water juſt warm, ſhould be occaſionally added, ſo as to favour the produced yeaſt, and groſs matter thrown up in the courſe of the proceſs, to eſcape or run over.

In this manner, the water in any number of caſks may be converted into beer. Stinking water, by this proceſs, will be purified and impregnated in the higheſt degree with vegetable fixed air. To prevent and cure the ſcurvy, it will be found, at leaſt, as efficacious as, if not ſuperior to, any ſmall beer in his Majeſty's brewhouſes. If a ſmall quantity of hops be added to each caſk intended to be kept ſome time, juſt before it be bunged up, the taſte of the fermented liquor may be thereby rendered more agreeable and familiar to many palates.

To correct ſtinking water, no method, at ſea, can be ſo expedient and effectual. To render ſtinking water a medicine, at ſea, will, no doubt, be eſteemed an object of public concern, in a commercial nation. By treating one or two casks of water in this manner every day, according to the demand, a ſhip's company may be ſupplied with a pleaſant, briſk, fermenting beverage.

If the *genuine* eſſence of malt were adopted, inſtead of ſugar, or treacle, or melaſſes, an excellent and pleaſant beer might be made on board every ſhip, in the courſe of a long voyage: but, though it might be judged more palatable than the liquor I have recommended, aſſuredly, it would not have more efficacy in the prevention and cure of the ſcurvy: for, the virtue of the liquor depending upon the degree of its impregnation with fixed air, the latter would be found as highly charged with it as the former.

Wine is very generally allowed to be one of the beſt, moſt generous, and moſt brilliant of all cordials. Wine is (I ſhall not be ſtrictly chemical) water charged with ardent ſpirit and ſome fixed air. By diſtillation it is found that good and rich wine yields about one fourth part of its quantity of that ardent ſpirit called *brandy*.

The people having lived ſome time upon ſea proviſions, and there being neither beer nor wine in the ſhip, and the water become offenſive and noxious; whenever, in long voyages any occaſion ſhall render it proper to treat the brave fellows with ſome good and *hearty* ſtuff, the commander may order the following liquor as a very excellent ſubſtitute for the beſt wine, to be ſerved to them at the rate of one pint each man, more or leſs, at the diſcretion of the commander.

Let ſixty pounds of ſoft ſugar decompoſe or ferment in ſixty gallons of water, during ten or twelve days; then ſtop the cask, if it be meant for preſent uſe, but if it ſhall not be intended for immediate uſe, let the vent-peg be kept out for a time.

To every twelve gallons of this liquor let there be added four gallons of brandy or rum, when the mixture ſhould be immediately ſerved out; otherwiſe the pungent acidulous principle, the fixed air, would eſcape, and the liquor would become vapid and flat.

All vegetable matter which decompoſes in water by the ſpirituous fermentation, copiouſly abounds in theſe principles, which will not fail to cure the ſcurvy. All the ſaccharine juices are ſubjects of the vinous fermentation; and in general, all vegetable farinaceous ſubſtances abound in fixed air and phlogiſton, which they yield in water by the above proceſs.

The juice of the grape is abundant in ſaccharine matter; whence it is very ſuſceptible of the ſpirituous fermentation. Two of the eſſential principles of ſaccharine matter are fixed air and phlogiſton. The juice of the ſugar cane is, in a very high degree, charged with ſaccharine matter. The juice of the ſugar cane will make a ſtrong and moſt excellent wine, inaſmuch as the juice of the ſugar cane contains a vaſt greater abundance of ſaccharine matter than the juice of the grape.

If I had an eſtate in the Weſt-Indies producing ſugar cane, inſtead of reducing the whole of the juice of my canes into ſugar, I ſhould convert a certain quantity of the juice into wine, by the vinous fermentation.

If this proceſs were properly conducted, it would be found that wine made ſolely from the juice of the ſugar cane, would be uncommonly rich, high-flavoured, generous, ſparkling, and brilliant.

FINIS.

ERRATA.

Page 67, line 1, for "*two ſpoonfuls*" read "*two tea ſpoonfuls.*" Page 149, line 16, for "*except oil and turpentine*" read "*except in reſpect of phlogiſton, oil, and turpentine.*"